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ABSTRACT

This guide provides basic information needed to meet standards for pesticide applicator certification. Chapter one outlines the legislative history of pesticide regulation in New Hampshire especially requirements for certification and pesticide classification. The second chapter provides clarification of terms as they are used in this series of documents. Additionally, specific standards of competency for each category of pesticide applicators are outlined. The final section contains a series of forty-eight pest fact sheets which describe insect pests, discuss their life cycles and indicate acceptable controls. (CS)

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Chapt. #I

NEW HAMPSHIRE STATE LAWS AND REGULATIONS

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History and Purpose

Pesticide control in New Hampshire is accomplished under two laws, "Economic Poisons Law" (RSA 438) and "Pesticide Control Law" (RSA 149D).

In 1949, the Economic Poisons Law was enacted to provide for the registration of all pesticides or economic poisons sold or distributed in the State. Through this law, package labeling is examined relative to ingredients, precautionary statements, restrictions on materials, adequate directions, and other pertinent information which is necessary for the safety and welfare of the purchaser or consumer. Since 1949, this law has been amended with the latest change being in 1971 (HB 138), which provides for the licensing of dealers selling pesticides.

The "Pesticide Control Law" came into being in 1965, and the purpose of the law was to allow for regulating the application of pesticides by both commercial applicators and private applicators growing and selling an agricultural commodity. Under this law people in the business of applying pesticides for others must be licensed with the State after demonstrating a practical knowledge of pesticides. Also, individual applying pesticides to their own commercial crops, and in other special situations, must obtain a "permit" to do so from the State. In 1971 with the passage of HB 64, the Pesticide Control Law was amended to include dealers in the licensing requirements. Under this amendment, dealers will have to meet certain requirements as to display, storage, record keeping, and dispensing of certain materials. With the passage of SB 289, in 1975, private applicators were required to become registered with the Pesticide Control Board, thru a demonstration of competency in the safe and effective use of pesticides as determined by the Board. This amendment also calls for the development and administration of a State Plan for certification of Pesticide Applicators, pursuant to Section 4 (a)(2) of the Federal Insecticide, Fungicide and Rodenticide Act, as Amended. Persons who violate any provisions of this chapter or the Board are liable for a civil forfeiture not to exceed five thousand dollars.

The overall purpose of the Pesticide Laws as set forth in RSA 149D is "to recognize the benefits of chemical pesticides in the economy of the State when applied in a safe, scientific, and proper manner; to safeguard public health and welfare and public assets in the soils, waters, forests, wildlife, and other natural resources of the State by insuring proper application of chemical pesticides; to provide for the scientific measuring and monitoring of residual pesticides in the waters and other natural resources of the State and to establish accurate records of pesticides use in the State without superseding controls presently in force."

Contained within this manual is a copy of the Economic Poisons Law, Pesticide Control Law and Regulations pertaining to these two laws.

Administration of the Laws

The administration of the Pesticide Control Law and Economic Poisons Law is the responsibility of the New Hampshire Department of Agriculture under the direction of the Commissioner of Agriculture. The Pesticides Control Supervisor, who works under the supervision of the Commissioner of Agriculture is charged with implementing and enforcing the laws and regulations and administering the control programs necessary to carry out the law.

The Economic Poisons Law is solely the responsibility of the Commissioner of Agriculture, whereas, the Pesticide Control Law has an advisory body, the Pesticides Control Board, attached to it. This Board, a ten member body, consists of representatives from different segments of government, from the general public, and from related organizations. The Commissioner of Agriculture presently serves as chairman of the Pesticide Control Board. The function of the Board is to enact programs and regulations as necessary to administer the law.

Within the Department of Agriculture is the Pesticide Control Office. Here, all of the administrative and clerical duties are performed, as well as the enforcement program. The office telephone number is 271 - 3550 and inquiries are welcome at any time.

The following laws are included in this section of the manual for your review and study: Pesticides Control Law, RSA 149-D; Economic Poisons Law, RSA 438; and Regulations of the New Hampshire Pesticide Control Board.

The State of
NEW HAMPSHIRE

PESTICIDES CONTROL

Revised Statutes Annotated Chapter 149-D
as inserted by 1965, 368:1 as amended

Issued by the
DEPARTMENT OF AGRICULTURE
19[illegible]

State of New Hampshire PESTICIDES CONTROL (RSA Chapter 149-D, as amended)

149-D:1 Declaration of Purpose. The purpose of this chapter is to recognize the benefits of chemical pesticides in the economy of the state when applied in a safe, scientific, and proper manner; to safeguard public health and welfare and public assets in the soils, waters, forests, wildlife, and other natural resources of the state by insuring proper application of chemical pesticides; to provide for the scientific measuring and monitoring of residual pesticides in the waters and other natural resources of the state, and to establish accurate records of pesticides use in the state without superceding controls presently in force.

149-D:2 Pesticides Control Board Established.

I. A pesticides control board is established to consist of the commissioner of agriculture, the director of the division of public health services or his designated alternate, the director of the division of resources development, the director of the fish and game department, or the chief of game management and research, the state entomologist, the executive director of the water supply and pollution control commission, and four members appointed by the governor with the consent of the council each for a term of three years and until his successor is appointed and qualified. Of the original appointments one member is for a term of one year, two for a term of two years, and one for a term of three years. The governor, with the consent of the council, shall make his appointments as follows: one from the general public (not in any of the following two categories); one person from a slate of three persons presented by the New Hampshire Horticultural Society; one person from a slate of three persons presented by the New Hampshire Arborists Association; and one a recognized ecologist, preferably holding a doctorate in ecology. The executive director of the water supply and pollution control commission shall act as executive secretary to the board and shall coordinate for the board the information and data developed by the water supply and pollution control commission and department of agriculture relating to this chapter. The board shall choose its own chairman. The four members appointed by the governor and council are not entitled to compensation for their services, but may receive reimbursement for their necessary traveling and other expenses while engaged in actual work of the board, and shall be paid from the monies appropriated for the purposes of this chapter.

(Amended by 1973, 366:4, eff June 27, 1973)

II. The administration and clerical activities under this chapter are the responsibility of the commissioner of agriculture with the advice of the board.

(Amended by 1975, 352:1, eff. Aug. 6, 1975.)

149-D:3 Definitions In this chapter:

I. "Board" means the pesticides control board as established by this chapter

II. "Commercial application" means any application of pesticides by a commercial applicator.

III. "Commercial applicator" means a person or persons, public or private corporation, partnership or other entity who applied pesticides for hire as one of their primary occupations.

IV. "Defoliant" means any substance or mixture of substances intended for causing the leaves or foliage to drop from a plant, with or without causing abscission.

V. "Desiccant" means any substance or mixture of substances intended for artificially accelerating the drying of plant tissue.

VI. "Person" means any individual, governmental entity, firm, partnership, corporation, company, society, association or any organized group of persons whether incorporated or not and every officer, agent or employee thereof. This term shall import either the singular or plural as the case may be.

VII. "Pest" means any plant or animal or virus, bacteria or other microorganism (except viruses bacteria or other micro-organisms on or in living man or other living animals) which exists in a place where it is not wanted, or in a quantity not wanted.

VIII. "Pesticide" means any chemical or biological agent used to control a pest or used as a plant regulator, defoliant or desiccant.

IX "Plant Regulator" means any substance or mixture of substances intended, through physiological action, for accelerating or retarding the rate of growth or rate of maturation, or for otherwise altering the behavior of plants or the produce thereof, but shall not include substances to the extent that they are intended as plant nutrients. trace elements, nutritional chemicals, plant inoculants and soil amendments. "Plant Regulator" shall not be required to include any of such of those nutrient mixtures or soil amendments as are commonly known as vitamin-hormone horticultural products intended for improvement, maintenance, survival, health and propagation of plants, and as are not for pest destruction and are nontoxic, nonpoisonous in the undiluted packaged concentration.
(Amended by 1975, 352:2, eff. Aug. 6, 1975.)

149-D:4 Registration Certificates and Permits.

I. No person shall engage in commercial application of pesticides within this state without first registering with the board. An annual fee of ten dollars shall be collected by the board for each registration. Each application for registration shall contain such information regarding the applicant's qualifications and proposed operations and other relevant matters as the board may require. Every person applying for a registration certificate will be required to demonstrate by examination, or by such other means as the board regulation may establish, his competency and ability to use pesticides in accordance with standards of the board. The board shall require from each applicant proof of financial responsibility in amounts to be determined under regulations as made by the board. Registered applicators shall maintain routine operational records pursuant to regulations of the board, which records shall be open to inspection at reasonable times by the board or its agents. Operational records for the preceding calendar year shall be submitted by an applicant for renewal of a certificate of registration. Upon submission of such records and satisfaction of such other conditions as the board may by regulation impose, the board shall renew a certificate of registration.

II. No person, other than a commercial applicator, shall apply pesticides in this state without first obtaining a written permit from the board, except as provided in RSA 149-D:9. The board shall require each applicant for a permit to demonstrate, by examination or other procedure prescribed by the board in regulations, the applicant's competence and ability to use pesticides in accordance with standards of the board. Permit holders shall maintain routine operational records pursuant to regulations of the board, which records shall be open to inspection at reasonable times by the board or its agents Operational records for the preceding calendar year shall be submitted to the board by an applicant for renewal of a permit. Upon submission of records and satisfaction of such other conditions as the board may by regulation impose, the board shall renew a permit.

III The board or its authorized agent, after opportunity for a hearing, may suspend any certificate of registration or permit. After opportunity for a hearing, the board may revoke or modify the provisions of any certificate of registration or permit issued under this chapter, if it finds that the holder is no longer qualified, has engaged in fraudulent business practices in the

application of pesticides, or has made any application in a careless, or negligent manner, or has violated any of the provisions of this chapter or regulations of the board, or has been convicted or is subject to a final order imposing a civil penalty under section 14 of the Federal Insecticide, Fungicide and Rodenticide Act, as amended, or under this chapter.
(Amended by 1975, 352:3, eff. Aug. 6, 1975.)

149-D:5 Application for Registration and Permits.

I. Annual certificates of registration or permits may be issued and fees shall be collected for the board by the department of agriculture.

II. Applications for registration and permits shall be on a form prescribed by the board and shall include the following:

(1) The full name and address of the person applying for the registration or permit
(2) If the applicant is an individual receiver, trustee, firm, partnership, association, corporation, or other organized group of persons whether or not incorporated, the full name of each member of the firm or partnership or the names of the officers of the association, corporation, or group, and the name of the person or persons charged with the responsibility for the application of pesticides.
(3) The name and address of a person whose domicile is in the state, and who is authorized to receive and accept services of summonses and legal notice of all kinds for the applicant.
(4) The type (ground or air) of any apparatus used the applicant to apply pesticides.
(5) Any other information prescribed by the board.

III. One member of each crew operating a piece of equipment as a commercial applicator must be registered as required under this chapter. Any application of pesticides by a commercial applicator or person requiring a permit must be by or under the direct supervision of an individual who has satisfied the examination requirement of RSA 149-D:4, I or the examination or other competence verification requirement of RSA 149-D:4, II.
(Amended by 1975, 352:4, eff. Aug. 6, 1975)

IV. Fees collected from applicants for registration as commercial applicators under this chapter constitute a special pesticides control fund which does not lapse but may be used at any time to carry out the provisions of this chapter and the provisions of chapter 438 of RSA.

149-D:6 Authority to Enter Premises. In enforcing this chapter, the board, or its duly authorized agents, has the authority to enter upon any public or private premises at reasonable times to:

I. Inspect the property when necessary before issuing a certificate of registration or permit for the application of a pesticide on the property and to observe the surrounding areas;

II. Inspect aircraft and ground equipment used or to be used for the application of pesticides;

III. Inspect crops, animals, or other property actually or reported to be exposed to substances applied by such equipment;

IV. Carry out any other necessary functions to implement the purposes of this chapter.

149-D:7 Regulations. After a public hearing the board is authorized to adopt and shall publish:

I. Regulations which may prescribe the time, the place, and the conditions under which pesticides may be used by commercial applicators in different areas of the state if the board finds that such pesticides may be injurious to persons, animals or crops, other than the pest or vegetation which it is intended to destroy, and may provide that pesticides shall be used only under permit of the board.

II. Regulations may prescribe the conditions and designate the vicinities for aircraft application of pesticides.

III. Regulations may provide that an annual permit may authorize the repeated commercial applications of pesticides under a contract calling for applications of pesticides by several crews either at the same or different times, subject to the initial approval by the board of the methods and materials used An example of this is the application of pesticides to a high tension electric line right of way.

IV. Regulations as are deemed necessary to carry out the provisions of this chapter, and to develop and administer a state plan for certification of pesticide applicators pursuant to section 4(a)(2) of the Federal Insecticide, Fungicide and Rodenticide Act, as amended.
(Amended by 1975, 352:5, eff. Aug.6, 1975)

V. Regulations which restrict or prohibit the sale and/or use by commercial applicators or any other person of pesticides which the board finds to be injurious or reasonably likely to be injurious to man or other living things other than those the pesticides are intended to control.(Added 1971, 68:1, eff. June 26, 1971.)

VI. Regulations which may designate those types of commercial establishments where particular pesticides may be sold (Added 1971, 68:1, eff. June 26, 1971.)

149-D:8 Enforcement. The commissioner of agriculture, on the advice of the board, shall be responsible for and arrange for the enforcement of this chapter and any regulations of the board.
(Amended by 1975, 352:6, eff. Aug. 6, 1975.)

149-D:9 Exemptions. The following type of application of pesticides is exempt from this chapter:

I. While engaged in research or experimental work for or under the direction of the state department of agriculture, U. S. Department of Agriculture or the university of New Hampshire agriculture experiment station except that these users shall keep records of pesticides used by them in a manner required by other users of pesticides under this chapter, and except that no pesticide which is classified for use only by certified applicators pursuant to section 3(d) of the Federal Insecticide, Fungicide and Rodenticide Act as amended, may be used pursuant to this paragraph.

II. The application of pesticides within, around, under or in the immediate vicinity of buildings by the property owner, providing crops raised therein or thereon are not offered for sale; provided, however, that no pesticide, the sale or use of which in the state is prohibited or restricted by the board, or by the United States environmental protection agency pursuant to section 3(d) of the Federal Insecticide, Fungicide and Rodenticide Act, as amended, may be applied under this paragraph except in accordance with said restriction or prohibition and provided further that a person applying pesticides as allowed by this paragraph, shall not allow any pesticides to enter any stream or body of water by reason of such application.
(Amended by 1975, 352:7, eff. Aug. 6, 1975)

149-D:10 Limiting Operation of Statute. Nothing in this chapter modifies or limits in any way the powers and duties of the commissioner of agriculture under RSA 437, as amended, and RSA 438; of the water pollution commission under RSA 149, 149-A and RSA 149-B; of the division of public health services under RSA 146 and RSA 148; of the fish and game department under paragraph VI of RSA 149:3; of the board of examiners for arborists under RSA 222, except for the provision of requiring a person licensed as an arborist to submit his records of application of pesticides under RSA 222:2.

149-D:11 Penalty

I Any person who violates any of the provisions of this chapter or regulations of the board or who falsifies any records required to be kept pursuant to this chapter, or who obtains a certification or permit on the basis of a misrepresentation of material fact shall be guilty of a misdemeanor if a natural person, or guilty of a felony if any other person.

II. Any person who violates any provision of this chapter, or any rule or regulation or order of the board shall in addition, be liable for a civil forfeiture not to exceed five thousand dollars for each such violation or each day of a continuing violation, which may be collected in a civil action or in connection with an action for injunctive relief brought by the attorney general. The proceeds of any such forfeiture shall be utilized in the enforcement of this chapter for pesticide control research or to remedy damage to the resources of the state caused by unlawful pesticide use and application.
(Amended by 1975, 352:8, eff. Aug. 6, 1975)

CHAPTER 438

ECONOMIC POISONS LAW

438:1 Definitions
438:2 Prohibited Acts.
438:3 Registration.
438:4 -Exception.
438:5 -Statement Required.
438:6 -Fees.
438:7 Submission of Formula.
438:8 Corrections before Registration.
438:9 Powers of Commissioner.
438:10 Rules and Regulations; Restricted Use Pesticides.
438:11 Adoption of Federal Rules.
438:12 Enforcement.
438:13 Exemptions.
438:14 Export.
438:15 Penalties.
438:16 Seizures; Forfeiture.
438:17 Cooperation.
438:18 Pesticide Dealer License
438:19 Handling and Storage.
438:20 Disposal.
438:21 Stop Sale, Use or Removal Orders.

438:1 Definitions. For the purposes hereof the following words shall have the following meanings:

I. The term "economic poison" means:

(a) Any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any insects, rodents, fungi, weeds, or other forms of plant or animal life or viruses, except viruses on or in living man or other animals, which the commissioner shall declare to be a pest, and

(b) Any substance or mixture of substances intended for use as a plant regulator, defoliant or desiccant. (Amended 1971, 19:1, eff. May 28, 1971.)

II. The term "insecticide" means any substance or mixture of substances intended for preventing, destroying, repelling or mitigating any insects which may be present in any environment whatsoever.

III. The term "fungicide" means any substance or mixture of substances intended for preventing destroying, repelling, or mitigating any fungi

IV. The term "rodenticide" means any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating rodents or any other vertebrate animal which the commissioner shall declare to be a pest

V. The term "herbicide" means any substance or mixture of substances intended for preventing destroying, repelling, or mitigating any weed.

VI The term "insect" means any of the numerous small invertebrate animals generally having the body more or less obviously segmented, for the most part belonging to the class Insecta, comprising six-legged, usually winged forms, as, for example, beetles, bugs, bees, flies and to other allied classes of arthropods whose members are wingless and usually have more than six legs, as, for example, spiders, mites, ticks, centipedes, and wood lice.

VII. The term "fungi" means all non-chlorophyll-bearing thallophytes (that is, all non-chlorophyll-bearing plants of a lower order than mosses and liverworts) as, for example, rusts, smuts, mildews, molds, yeasts, and bacteria, except those on or in living man or other animals.

VIII. The term "weed" means any plant which grows where not wanted.

IX. The term "ingredient statement" means either——(1) a statement of the name and percentage of each active ingredient, together with the total percentage of the inert ingredients, in the economic poison; or (2) a statement of the name of each active ingredient, together with the name of each and total percentage of the inert ingredients if any there be, in the economic poison (except option 1 shall apply if the preparation is highly toxic to man, determined as provided in section 9 of this chapter); and, in addition to (1) or (2) in case the economic poison contains arsenic in any form a statement of the percentages of total and water soluble arsenic, each calculated as elemental arsenic.

X. The term "active ingredient" means in the case of:

(a) An economic poison other than a plant regulator defoliant, or desiccant, an ingredient which will prevent, destroy, repel or mitigate insects, nematodes, fungi, rodents, weeds or other pests;

(b) A plant regulator, an ingredient which, through physiological action, will accelerate or retard the rate of maturation or otherwise alter the behavior of ornamental or crop plants or the produce thereof;

(c) A defoliant, an ingredient which will cause the leaves or foliage to drop from a plant;

(d) A desiccant, an ingredient which will artificially accelerate the drying of plant tissue (Amended 1971, 19:2, eff. May 28, 1971.)

XI. The term "inert ingredient" means an ingredient which is not an active ingredient.

XII. The term "antidote" means the most practical immediate treatment in case of poisoning and includes first aid treatment

XIII. The term "commissioner" means the commissioner of agriculture.

XIV. The term "label" means the written, printed, or graphic matter on, or attached to, the economic poison, or the immediate container thereof, and the outside container or wrapper of the retail package, if any there be of the economic poison.

XV. The term "labeling" means all labels and other written, printed, or graphic matter (1) upon the economic poison or any of its containers or wrappers; (2) accompanying the economic poison at any time; (3) to which reference is made on the label or in literature accompanying the economic poison, except when accurate, non-misleading reference is made to current official publications of the United States department of agriculture or interior, the United State public health service, state experiment stations, New Hampshire University, or any other similar federal institutions or official agencies of this state or other states authorized by law to conduct research in the field of economic poisons.

XVI. The term "adulterated" shall apply to any economic poison if its strength or purity falls below the professed standard of quality as expreseed on labeling or under which it is sold, or if any substance has been substituted wholly or in part for the article, or if any valuable constituent of the article has been wholly or in part abstracted.

XVII. The term "misbranded" shall apply

(1) to any economic poison if its labeling bears any statement, design, or graphic representation relative thereto or to its ingredients which is false or misleading in any particular;

(2) to any economic poison

(a) if it is an imitation of or is offered for sale under the name of another economic poison;

(b) if the labeling accompanying it does not contain instructions for use which are necessary and, if complied with, adequate for the protection of the public;

(c) if its labeling bears any reference to registration hereunder;

(d) if the label does not contain a warning or caution statement which may be necessary and, if complied with, adequate to prevent injury to living man and other vertebrate animals;

(e) if the label does not bear an ingredient statement on that part of the immediate container and on the outside container or wrapper, if there be one, through which the ingredient statement on the immediate container can be clearly read, of the retail package which is presented or displayed under customary conditions of purchase;

(f) if any word, statement, or other information required by or under the authority thereof to appear on the labeling is not promenently placed thereon with such conspicuousness as compared with other words, statements, designs, or graphic matter in the labeling and in such terms as to render it likely to be read and understood by the ordinary individual under customary conditions of purchase and use; or

(g) if in the case of an insecticide, nematocide, fungicide, or herbicide, when used as directed or in accordance with commonly recognized practice, it shall be injurious to living man or other animals or vegetation except weeds, to which it is applied, or to the person applying such economic poison;

(h) in the case of a plant regulator, defoliant, or desiccant when used as directed it shall be injurious to living **man** or other animals, or vegetation to which it is applied, or to the person applying such economic poison. Provided, that physical or physiological effects on plants or parts thereof shall not be deemed to be injury, when this is the purpose for which the plant regulator, defoliant or desiccant was applied, in accordance with the label claims and recommendations. (Amended 1971, 19:3,eff.May 28, 1971)

XVIII. The term "nematocide" means any substance or mixture of substances intended for preventing, destroying, repelling or mitigating nematodes. (Added 19 1, 19:4, eff. May 28, 1971.)

XIX The term "plant regulator" means any substance or mixture of substances, intended through physiological action, for accelerating or retarding the rate of growth of maturation, or for otherwise altering the behavior of ornamental or crop plants or the produce thereof, but shall not include substances to the extent that they are intended as plant nutrients, trace elements, nutritional chemicals, plant inoculants, and soil amendments. (Added 1971, 19:4, eff. May 28, 1971.)

XX. The term "defoliant" means any substance or mixture of substances intended for causing the leaves or foliage to drop from a plant, with or without causing abscission. (added 1971, 19:4, eff. May 28, 1971.).

XXI. The term "desiccant" means any substance or mixture of substances intended for artificially accelerating the drying of plant tissues. (Added 1971, 19:4, Eff. May 28, 1971.)

XXII. The term "nematode" means invertebrate animals of the phylum nematheliminthes and class Nematoda, that is, unsegmented round worms with elongated, fusiform, or saclike bodies covered with cuticle, and inhabiting soil, water, plants or plant parts; may also be called nemas or eelworms. (Added 1971, 19:4, eff. May 28, 1971.)

XXIII. The term "person" means any individual, partnership, association, corporation or organized group of persons whether incorporated or not. (Added 1971. 19:4, eff. May 28, 1971.)

XXIV. The term "registrant" means the person registering any economic poison pursuant to the provisions of this chapter. (Added 1971, 19:4, eff. May 28, 1971.)

XXV. The term "restricted use pesticide" means any economic poison which the commissioner has found and determined, subsequent to a hearing, to be injurious to persons, pollinating insects, bees, animals, crops, wildlife, or lands other than the pests it is intended to prevent, destroy, control, or mitigate. (Added 1971, 19:4, eff. May 28, 1971.)

XXVI. The term "pesticide dealer" means any person who is engaged in the business of distributing, selling, offering for sale, or holding for sale "restricted use pesticides" and/or any other economic poisons for distribution directly to users. Exempt from the term "pesticide dealer" are those persons whose sales are limited to economic poisons in consumer sized packages which are labeled and intended for home and garden use only. This exemption does not apply to any person selling restricted use pesticides. (Added 1971, 19:4, eff. May 28, 1971.)

History

Source. 1949, 311:1, par. 1. 1971, 19:1-4, eff. May 28, 1971.

Separability clause. Sections 1-17 of this chapter are subject to a separability clause.

Amendments-- 1971 Paragraph I: Designated original provisions as (a) and added (b).

Paragraph X: Amended generally.

Paragraph XVII: Subparagraph (2)(g) rephrased and (2)(h) added.

Paragraphs XVIII-XXVI: Added.

438:2 Prohibited Acts.

I. It shall be unlawful for any person to distribute, sell, or offer for sale within this state or deliver for transportation or transport in intrastate commerce or between points within this state through any point outside this state any of the following:

(1) Any economic poison which has not been registered pursuant to the provisions of section 3 hereof, or any economic poison if any of the claims made for it or any of the directions for its use differ in substance from the representations made in connection with its registration, or if the composition of an economic poison differs from its composition as represented in connection with its registration; provided, that in the discretion of the commissioner, a change in the labeling or formula of an economic poison may be made within a registration period without requiring re-registration of the product.

(2) Any economic poison unless it is in the registrant's or the manufacturer's unbroken immediate container, and there is affixed to such container, and to the outside container or wrapper of the retail package, if there be one, through which the required information on the immediate container cannot be clearly read, a label bearing

(a) the name and address of the manufacturer, registrant, or person for whom manufactured;

(b) the name, brand, or trade-mark under which said article is sold; and

(c) the net weight or measure of the content subject, however, to such reasonable variations as the commissioner may permit.

(3) Any economic poison which contains any substance in quantities highly toxic to man, determined as provided in section 9 hereof, unless the label shall bear, in addition to any other matter required hereby,

(a) the skull and crossbones;

(b) the word "poison" prominently, in red, on a background of distinctly contrasting color; and

(c) a statement of an antidote for the economic poison.

(4) The economic poisons commonly known as standard lead arsenate, basic lead arsenate, calcium arsenate, magnesium arsenate, zinc arsenate, zinc arsenite, sodium floride, sodium fluosilicate, or barium fluosilicate unless they have been distinctly colored or discolored as provided by regulations issued in accordance herewith, or any other white powder economic poison which the commissioner, after investigation of and after public hearing on the necessity for such action for the protection of the public health and the feasibility of such coloration or discoloration, shall, by regulation, require to be distinctly colored or discolored; unless it has been so colored or discolored; provided, that the commissioner may exempt any economic poison to the extent that it is intended for a particular use or uses from the coloring or discoloring required or authorized by this section if he determines that such coloring or discoloring for such use or uses is not necessary for the protection of the public health.

(5) Any economic poison which is adulterated or misbranded.

II. It shall be unlawful for any person to detach, alter, deface, or destroy, in whole or in part, any label or labeling provided for herein or regulations promulgated hereunder, or to add any substance to, or take any substance from, an economic poison in a manner that may defeat the purpose hereof.

III. It shall be unlawful for any person to use for his own advantage or to reveal other than to the commissioner or proper officials or employees of the state or to the courts of this state in response to a subpoena, or to physicians, or in emergencies to pharmacists and other qualified persons, for use in the preparation of antidotes, any information relative to formulas of products acquired by authority hereof.

History

Source. 1949, 311:1, par. 2, eff. Jan.1, 1950.

Annotations

1. Jurisdiction over foreign corporation

Registration of a product so that it may be legally sold in New Hampshire is indicative of a foreign corporation's submission to the jurisdiction of the local courts. W. H. Elliott & Sons, Co. v.E. & F. King Co. (1956) 144 F.Supp. 401.

438:3 Registration. Every economic poison which is distributed, sold or offered for sale within this state or delivered for transportation or transported in intrastate commerce or between points within this state through any point outside this state shall be registered in the office of the commissioner, and such registration shall be renewed annually; provided, that products which have the same formula, are manufactured by the same person, the labeling of which contains the same claims, and the labels of which bear a designation identifying the product as the same economic poison may be registered as a single economic poison; and additional names and labels shall be added by supplement statements during the current period of registration

History

Source 1949, 311:1, par. 3, eff. Jan. 1, 1950.

Annotations

1 Service of process

Registration of a product under this section in order that mixtures containing it could be legally sold in the state operates to subject to service of process one who sold the product to a manufacturer in another state who used it in paint purchased by a New Hampshire user. W.H. Elliott & Sons Co. v. Nuodex Products Co. (1957) 243 F.2d 116, vacating 144 F.Supp. 401.

438:4 -Exception. Notwithstanding any other provisions hereof, registration is not required in the case of an economic poison shipped from one plant within this state to another plant within this state operated by the same person

History

Source. 1949, 311:1, par. 8, eff. Jan. 1, 1950.

438:5 -Statement Required. The registrant shall file with the commissioner a statement including (1) the name and address of the registrant and the name and address of the person whose name will appear on the label, if other than the registrant; (2) the name of the economic poison; (3) a complete copy of the labeling accompanying the economic poison and a statement of all claims to be made for it including directions for use; and (4) if requested by the commissioner a full description of the tests made and the results thereof upon which the claims are based. In the case of renewal of registration, a statement shall be required only with respect to information which is different from that furnished when the economic poison was registered or last re-registered.

History

Source. 1915, 118:2, PL 185:2 RL 227:2 1949, 311:1, par 4, eff. Jan.1, 1950.

438:6 -Fees. The registrant shall pay an annual fee of ten dollars for each economic poison registered. The fees collected under this section constitute a special pesticide control fund, which does not lapse but may be used at any time to carry out the provisions of this chapter and the provisions of chapter 149-D of RSA.

History

Source. 1915, 118:2, PL 185:2. RL 227:2. 1949, 311:1, par.5. RSA 438:6. 1965, 368:3. 1967, 270:7, eff. Aug. 26, 1967.

Amendments- 1965. Amended section generally by deleting provision for registering any number of brands for $100 and by deleting provision limiting special fund to $3000 and by adding reference to RSA 149-C.

-1967. Changed RSA reference from 149-C to 149-D.

438:7 Submission of Formula. The commissioner, whenever he deems it necessary in the administration hereof may require the submission of the complete formula of any economic poison. If it appears to the commissioner that the composition of the article is such as to warrant the proposed claims for it and if the article and its labeling and other material required to be submitted comply with the requirements of section 2 hereof, he shall register the article.

History

Source. 1949, 311:1, par.6, eff. Jan. 1, 1950.

438:8 Corrections before Registration. If it does not appear to the commissioner that the article is such as to warrant the proposed claims for it or if the article and its labeling and other material required to be submitted do not comply with the provisions of this chapter he shall notify the registrant of the manner in which the article labeling, or other material required to be submitted fail to comply with the chapter so as to afford the registrant an opportunity to make the necessary correction If upon receipt of such notice the applicant does not make the correction, the commissioner may refuse to register the article The commissioner, in accordance with the procedures specified herein, may suspend or cancel the registration of an economic poison whenever it does not appear that the article or its labeling complies with the provisions of this chapter. Whenever an application for registration is refused or the commissioner proposes to suspend or cancel a registration, notice of such action shall be given to the applicant or registrant who shall have thirty days from the date of such notice to request a hearing on the proposed action of the commissioner. The hearing shall be conducted by the commissioner, or his designee, for the purpose of receiving evidence relevant and material to the issues, following the conclusion of which the commissioner shall issue an order with findings of fact and notify the applicant or registrant thereof. The commissioner's order shall be based only on substantial evidence of record taken at the hearing.

History

Source. 1949, 311:1, par.7. RSA 438:8. 1971, 19:5, eff. May 28, 1971.

Amendments--1971. Amended section generally.

438:9 Powers of Commissioner. The commissioner is authorized, after opportunity for a hearing (1) to declare as a pest any form of plant or animal life or virus which is injurious to plants, men, domestic animals, articles or substances; (2) to determine whether economic poisons are highly toxic to man; and (3) to determine standards of coloring or discoloring for economic poisons, and to subject economic poisons to the requirements of paragraph I(4) of section 2 hereof.

History

Source. 1949, 311:1, par.9, eff. Jan 1, 1950.

438:10 Rules and Regulations; Restricted Use Pesticides.

I. The commissioner is authorized, after due notice and a public hearing, to make appropriate rules and regulations for carrying out the provisions of this chapter, including but not limited to rules and regulations providing for:

(a) The collection and examination of samples of economic poisons or devices;

(b) The safe handling, transportation, storage, display, distribution, and disposal of economic poisons and their containers;

(c) Restricting or prohibiting the use of certain types of containers or packages for specific economic poisons, which restrictions may apply to type of contruction, strength, and/or size to alleviate danger of spillage, breakage or misuse

II. The commissioner shall adopt the list of "restricted use pesticides" adopted by the pesticides control board as defined in RSA 149-D:2 for the state or for designated areas within the state. The commissioner may by regulation specify the time and conditions of sale or distribution of such "restricted use pesticides" and may, if he deems it necessary to carry out the provisions of this chapter, require that any or all "restricted use pesticides" shall be purchased and possessed only under permit of the commissioner and under his direct supervision in certain areas and/or under certain conditions or in certain quantities or concentrations: provided, that any person licensed to sell such economic poisons may purchase and possess such economic poisons without a permit.

History

Source 1949, 311:1, par.10 RSA 438:10 1971, 19:6, eff. May 28 1971.

Amendments-1971. Amended Section generally.

438:11 Adoption of Federal Rules. In order to avoid confusion endangering the public health, resulting from diverse requirements, particularly as to the labeling and coloring of economic poisons, to avoid increased costs to the people of this state due to the necessity of complying with such diverse requirements in the manufacture and sale of such poisons, and to secure uniformity between the requirements of the several states and the federal government relating to such poisons, the commissioner is authorized, after due public hearing, to adopt by regulation such regulations, applicable to and in conformity with the primary standards established hereby, as have been or may be prescribed in the United States department of agriculture with respect to economic poisons.

History

Source 1949 311:1, par. 11, eff. Jan. 1, 1950.

438:12 Enforcement. The examination of economic poisons shall be made under the direction of the commissioner for the purpose of determining whether they comply with the requirements hereof. If it shall appear from such examination that an economic poison fails to comply with the provisions hereof, and the commissioner contemplates instituting criminal proceedings against any person, the commissioner shall cause appropriate notice to be given to such person. Any person so notified shall be given an opportunity to present his views, either orally or in writing, with regard to such contemplated proceedings and if thereafter in the opinion of the commissioner it shall appear that the provisions hereof have been violated by such person, then the commissioner shall refer the facts to the county attorney for the county in which the violation shall have occurred with a copy of the results of the analysis or the examination of such articles; provided, however, that nothing herein shall be construed as requiring the commissioner to report for prosecution or for the institution of libel proceedings minor violations hereof whenever he believes that the public interests will be best served by a suitable notice of warning in writing.

It shall be the duty of each county attorney to whom any such violation is reported to cause appropriate proceedings to be instituted and prosecuted without delay

History

Source 1949, 311:1, par. 12, eff. Jan. 1, 1950.

Revision note. "County Solicitor" changed to "county attorney", see RSA 21:27-a (supp.)

438:13 Exemptions. The penalties provided for violations of paragraph 1 of Section 2 shall not apply to (1) any carrier while lawfully engaged in transporting an economic poison within this state, if such carrier shall, upon request, permit the commissioner or his designated agent to copy all records showing the transactions in and movement of the articles; (2) public officials of this state and the federal government engaged in the performance of their official duties; (3) the manufacturer or shipper of an economic poison for experimental use only by or under supervision of an agency of this state or of the federal government authorized by law to conduct research in the field of economic poisons, or by others if the economic poison is not sold and if the container thereof is plainly and conspicuously marked "For experimental use only - Not to be sold," together with the manufacturer's name and address; provided, however, that if a written permit has been obtained from the commissioner, economic poisons may be sold for experiment purposes subject to such restrictions and conditions as may be set forth in the permit.

History

Source. 1949, 311:1, par. 13, eff. Jan. 1, 1950.

438:14 Export. No article shall be deemed in violation hereof when intended solely for export to a foreign country, and when prepared or packed according to the specifications or directions of the purchaser If not so exported, the provisions shall apply.

History

Source. 1949, 311:1, par. 14, eff. Jan 1, 1950.

438:15 Penalties

I. Any person violating any of the provisions hereof shall be fined not more than one hundred dollars for the first offense and for a second offense within a period of three years shall be fined not less than one hundred dollars nor more than five hundred dollars.

II. Notwithstanding any other provisions of this section, any person, with intent to defraud, who uses or reveals information relative to formulas of products acquired under authority hereof shall be fined not more than one hundred dollars or imprisoned for not more than one year, or both

History

Source. 1949, 311:1, par. 15, eff. Jan. 1, 1950.

438:16 Seizures; Forfeiture. Any economic Poison that is distributed, sold, or offered for sale within this state or delivered for transportation or transported in intrastate commerce or between points within this state through any point outside this state shall be liable to be proceeded against in any court in any county of the state where it may be found and seized for forfeiture as provided by chapter 617, RSA,

(1) if it is adulterated or misbranded;

(2) if it has not been registered under the provisions of section 3;

(3) if it fails to bear on its label the information required hereby;

(4) if it is a white powder economic poison and is not colored as required hereunder.

History

Source. 1949, 311:1, par. 16, eff. Jan. 1, 1950.

438:17 Cooperation. The commissioner is authorized and empowered to cooperate with, and enter into agreements with, any other agency of this state, the United States department of agriculture, and any other state or agency thereof for the purpose of carrying out the provisions hereof and securing uniformity of regulations.

History

Source. 1949, 311:1, par. 17, eff. Jan. 1, 1950.

438:18 Pesticide Dealer License.

I. No person shall act in the capacity of a pesticide dealer or shall engage in the business of, advertise as, or assume to act as a pesticide dealer unless he has obtained an annual license from the commissioner. which shall expire on December thirty-first of each year A license shall be required for each location or outlet from which such economic poisons are distributed, sold held for sale. or offered for sale.

II. Application for a license shall be accompanied by a ten dollar annual license fee and shall be on a form prescribed by the commissioner and shall include the full name of the person applying for such license. If such applicant is an individual, receiver, trustee, firm, partnership, association or corporation, the full name of each member of the firm or partnership or the names of the officers of the association or corporation shall be given on the application. Such application shall further state the principal business address of the applicant in the state and elsewhere and the name of a person domiciled in this state authorized to receive and accept service of summons of legal notices of all kinds for the applicant, and any other necessary information prescribed by the commissioner; provided that the provisions of this section shall not apply to a pesticide applicator who sells economic poisons only as an integral part of his pesticide application service when such economic poisons are dispensed only through apparatuses used for such economic poison application; provided further. that the provisions of this section shall not apply to any federal, state or county agency which provides economic poisons for their own programs.

III. Each applicant shall satisfy the commissioner as to his own knowledge of the laws and regulations governing the use and sale of economic poisons and his responsibility in carrying on the business of a pesticide dealer.

Each employee or agent of a pesticide dealer who sells or recommends "restricted use pesticides" shall satisfy the commissioner as to his knowledge of the laws and regulations governing the use and sale of such "restricted use pesticides".

IV. Each pesticide dealer shall be responsible for the acts of each person employed by him in the solicitation and sale of economic poisons and all claims and recommendations for use of economic poisons. The dealer's license shall be subject to denial, suspension or revocation after a hearing for any violation of this chapter, whether committed by the dealer, or by the dealer's officer, agent or employee.

V. Every licensed pesticide dealer who changes his address or place of business shall immediately notify the commissioner.

History

Source 1971. 19:7, eff. Jan.1. 1972.

438:19 Handling and Storage. No person shall handle, transport, store, display, or distribute economic poisons in such a manner as to endanger man and his environment or to endanger food, feed, or any other products that may be transported, stored, displayed, or distributed with such economic poisons.

History

Source 1971. 19:7, eff. May 28, 1971.

438:20 Disposal. No person shall dispose of, discard, or store any economic poisons or economic poison containers in such a manner as may cause injury to humans, vegetation, crops, livestock, wildlife, pollinating insects or to pollute any water supply or waterway.

History

Source 1971, 19:7, eff. May 28, 1971.

438:21 Stop Sale, Use or Removal Orders. When the commissioner or his authorized agent has reasonable cause to believe an economic poison or device is being distributed in violation of any of the provisions of this chapter, or of any of the prescribed regulations under this chapter, he may issue and serve a written "Stop Sale, Use or Removal" order upon the owner or custodian of any such economic poison or device. The economic poison or device shall not be sold, used or removed until the provisions of this article have been complied with and the pesticide or device has been released by the commissioner or the violation has been otherwise disposed of as provided in this chapter by a court of competent jurisdiction.

History

Source. 1971, 19:7, eff. May 28, 1971.

NEW HAMPSHIRE PESTICIDES CONTROL BOARD

85 MANCHESTER STREET, CONCORD, NEW HAMPSHIRE 03301

REGULATIONS January 1, 1970 - Revised - June 8, 1972
January 18, 1976
October 4, 1977

The Pesticides Control Board, authorized by Section 149-D:7, Chapter 368, Laws of 1965, and amended by HB 64, 1971, adopts, after public hearing, the following regulations relating to pesticides control

I. Definitions

The following words as used in these regulations, unless the context clearly indicates otherwise, shall have the following meaning:

1. "Board" - The Pesticides Control Board as established by Chapter 368, Laws of 1965, (RSA 149-D).

2. "Disposal" - Discarding, open burning or incineration of excess of unusable pesticides materials and discarding of pesticides containers, or the sale or transfer of ownership of pesticides containers for use other than to contain pesticides.

3. "Surface waters or their tributaries used for Public Water Supply" - Those lakes, ponds, rivers, streams, or other open waters designated and delimited by the Water Pollution Commission as sources of Public Water Supply.

4. "Watershed of Public Water Supply" - That area which contributes surface water runoff either directly to a surface source of a Public Water Supply or to the reservoir, lake, pond, river, stream, ditch, watercourse, or intermittent rivulet or other open waters that at any time flow directly or ultimately into designated sources of Public Water Supply.

5. "Mechanically-powered equipment" - Any device that will distribute pesticides through means other than by hand power.

6. "Within, around, under, or in the immediate vicinity of buildings by a property owner or his agent" - Any application of pesticides for which the obvious intent is control of pests in, on, or under buildings.

7. "Crew" - (a) One or more men working with one piece of mechanically powered equipment that has a capacity exceeding 3 gallons of liquid or 25 pounds of dry material.

(b) Those men working within speaking distance of one another and each applying pesticides by hand or each operating a piece of mechanically powered equipment that has a capacity of not more than 3 gallons of liquid or 25 pounds of dry material.

(c) Definitions A and B do not apply to stem or stump applications of herbicides on an individual tree basis providing such applications are made under the supervision of a registered applicator.

8. "Drift" - The airborne movement of pesticides resulting from a pesticide application such as to carry pesticides beyond the target pest area.

9. "Residue" - The pesticide remaining in the environment or on a crop at the time of harvesting.

10. "Pesticide" - Means any chemical or biological agent used to control a pest. (149 D:3 II). The term pesticide shall include but not be limited to the following materials: acaricides (miticides), insecticides, nematocides, herbicides (weed and brush killers, dessicants and defoliants), fungicides, molluscides, repellents, algaecides, rodenticides, disinfectants and fumigants.

*11. "Operational Registration Certificates" - Certificates issued to persons who apply pesticides commercially or who are present and in direct command of such persons.

*12. "Supervisory Registration Certificates" - Certificates issued to persons who are responsible for deciding whether or not pesticides are to be employed, how they are to be used, and the methods of application and precautions to be taken in the use of such pesticides.

13. "Under the Direct Supervision of a Certified Applicator" - means that unless otherwise prescribed by its labeling, a pesticide shall be considered to be applied under the direct supervision of a certified applicator if it is applied by a competent person acting under the instruction and control of a certified applicator who is available if and when needed, even though such certified applicator is not physically present at the time and place the pesticide is applied.

14. "Private Applicator" - means an individual who uses or supervises the use of any pesticides, whether classified general use or state restricted use, for purposes of producing any agricultural commodity on property owned or rented by him or his employer (if applied without compensation other than trading of personal services between producers of agricultural commodities) on the property of another person.

15. "State Restricted Use Pesticide" - means any pesticide or pesticide use classified for restricted use by the New Hampshire Pesticide Control Board.

16. "Single Purchase/Single Use Permit" - is a permit which certifies the private applicator to make a single purchase for a single use of a restricted use product (or other products of the same formulation) on a one time basis.

17. "Agricultural Commodity" - means any plant, or part thereof, or animal, or animal product, produced by a person (including farmers, ranchers, vineyardists, plant propogators, christmas tree growers, agriculturists, floriculturists, orchardists, foresters, or other comparable persons) primarily for sale, consumption, propogation, or other use by man or animals.

18. "On-highway vehicle" - any motor vehicle of four wheels or more, duly licensed or registered with any Motor Vehicle Division to travel over the public roads and highways of the state.

19. "Commercial Applicator Not for Hire" - those commercial applicators who apply pesticides to their own premises, that of their immediate employers or when performing duties required of them by a governmental subdivision; and any other commercial applicator other than a "Commercial Applicator for Hire"; including but not limited to golf course personnel, state, federal and municipal employees.

II. General Regulations

1. All pesticides or formulations thereof, used or applied in New Hampshire must be registered with the New Hampshire Department of Agriculture as provided for in the Economic Poisons Law, RSA Chapter 438.

2. Registered pesticides are to be used in strict accordance with manufacturers' current labeling, or in accordance with recommendations from legally constituted authorities, except for experimental work as defined under "Exemptions" in Section 149-D:9, Chapter 368, Laws 1965. Violation of this requirement and other regulations is subject to penalties as provided for in RSA 149-D:11, as amended.

3. Pesticides Anti-Siphon. All pest control equipment using pesticides and drawing water from the surface waters of the State as defined in RSA 149 shall have an effective anti-siphon device approved by the Board to prevent back flow.

4. All on-highway vehicles when used for business purposes for the commercial application of pesticides by commercial applicators be identified by lettering and/or signs that will identify the applicator's business together with license number; and further that said lettering of business name and license number shall not be less than two inches in height; excepting those registered as "Commercial Applicators Not For Hire" shall not be required to identify their vehicles.

II-A. Registration of Commercial Applicators

1. Every person applying for a registration certificate will be required to pass an examination prepared and administered by the Board.

2. A person who holds a commercial applicator's certificate or license in another state where the requirements and examination for registration are considered by the Board to be substantially the same as required by this law, may not be required to take an examination in this State for registration, but shall be required to acquire a registration.

*3. (a) At least one employee at the supervisory or managerial level of each business entity applying pesticides commercially shall be required to hold a supervisory level certificate of registration. If more than one supervisory office or district exists in the State for any one business entity then at least one member of each such district shall be required to hold a supervisory level certificate of registration.

(b) At least one member of each crew, Article I - Paragraph 7, must be registered at either the operational or supervisory level and present whenever and wherever a commercial application of pesticides is made in this state.

(c) Upon adoption of regulation 3a and b above, all current certificates of registration issued to date (December 31, 1969) shall be at the operational level and those people who have previously achieved a satisfactory grade on the examination as given are considered to qualify for operational level of registration.

(d) Applications for examination for the operational level will be accepted only from those who have attained their 18th birthday.

(e) Application for admittance to examination leading to licensing at the supervisory level will not be accepted unless the applicant has satisfied one of the following requirements: (1) been licensed at the operational level for 5 growing seasons, or as long as certificates have been issued and/or has been actively working in the field for this period of time under the supervision of a person holding a supervisory license. (2) is a graduate of a recognized college or university at which he or she majored either in entomology, plant pathology, forestry, fruit, berry, and vegetable growing or in other fields requiring training in biological principles including the use and application of pesticides and has been licensed at the operational level for one growing season or has been actively working under a person holding a supervisory license or under the direction of a person professionally qualified at or above such a level, for this period of time. (3) is a graduate of a two-year school of agriculture or a technical institute majoring in the fields noted in (2) above and who has been licensed at the operational level for 3 growing seasons under the supervision of a person holding a supervisory license. (4) is the proprietor of a business intending to offer custom spraying services; or is a governmental employee who is responsible for the conduct of programs involving the use of pesticides; providing that such person shall meet the requirements called for under 1, 2, or 3 of E; excepting that those registering as "Commercial Applicators Not For Hire" shall not be required to meet (1) (2) (3) (4) of e above.

4. Each applicant for registration shall show proof of financial responsibility to consist of the following minimum insurance coverage; excepting that those applicants for registration as Commercial Applicators Not For Hire shall not be required to show proof of financial responsibility.

1. Ground Application:

Public Liability - - - - - $20,000 each person
Public Liability - - - - - $40,000 each occurrence
Property Damage (including
Chemical Liability)- - - - $10,000 each occurrence
$25,000 aggregate

2. Aircraft Application:

Public Liability - - - - - $50,000 each person
Public Liability - - - - -$100,000 each occurrence
Property Damage (including
Chemical Liability)- - - - $25,000 each occurrence
$50,000 aggregate

II-B. License Renewals - Delinquent Renewals, Retesting

Any person holding a current valid license, permit, or certification may renew such license, permit, or certification for the next year without taking another examination unless the Board determines that additional knowledge related to Classifications for which the applicant has applied makes a new examination necessary. However, if the license, permit, or certification is not renewed by June 1 of each year then such licensee, permitee or certificate holder shall be required to take another examination.

II-C. Certification - Denial, Suspension, Revocation and Modification

The board or its authorized agent may deny certification to any person that is found to be unqualified to apply pesticides as established by RSA 149-D:4, I and II. In addition the Board or its authorized agent, may deny or after opportunity for a hearing, may revoke or modify the provisions of any certificate of registration or permit issued under this chapter, if it finds that the holder is no longer qualified, has engaged in fraudulent business practices in the application of pesticides, or has made any application in a careless, or negligent manner, or has violated any of the provisions of the New Hampshire Pesticide Control laws or the regulations, or has been convicted of or is subject to a final order imposing a civil penalty under section 14 of the Federal Insecticide, Fungicide and Rodenticide Act, as amended, or under the New Hampshire Pesticide Control Laws RSA 149-D.

III. Restrictions on the Application of Pesticides by Commercial Applicators and Permittees.

1. No pesticide shall be applied to Public Water Supplies or their tributaries except by legally established water supply entities or their agents as authorized by the Water Pollution Commission. Pesticide applications to lands near or adjacent to Public Water Supplies shall be made in such a manner that no pesticides drift or flow into such water supplies.

2. No pesticide application may be made within 400 feet of gravel packed wells used for Public Water Supply or within 250 feet of other wells so used, unless materials and methods to be employed have been approved by the Board upon the recommendation of the Water Pollution Commission.

3. a. Pesticide applications shall not be made on the watershed of a public water supply unless such applications have been approved by the Board upon the recommendations of the Water Pollution Commission.

   b. No pesticide shall be applied to woodland areas exceeding 50 acres without the prior approval of the Board upon the recommendation of the State Forester and the Director of Fish and Game Department.

4. Pesticide applications shall not be made in a watershed or on marshland for control of forest insects, mosquitoes, or black flies unless such applications have been approved by the Board.

5. Pesticide applications to areas adjacent to crops or pasturage shall be such that contamination of crops or pasturage does not occur.

6. No person shall apply pesticides either in a manner that causes or may tend to cause unreasonable damage to non-target areas or unreasonable harm or injury to persons. Without limiting the generality of the foregoing an "unreasonable" amount of drift may be that which causes a violation of the food tolerances established by the USDA/FDA.

7. Pesticide applications to any surface waters of the State for the control of aquatic nuisances or for any other reason shall not be made unless such applications have been approved by the Board upon recommendation of the Water Pollution Commission.

8. No application of pesticides by means of aircraft shall be made within the State without prior approval of the Board or its designated representative after consultation with the affected agencies.

9. No application of pesticides shall be made by mechanically powered equipment at such times as the wind velocity will cause a hazardous chemical to drift beyond the target area.

10. No herbicide shall be applied to brush along public road rights of way of this State of more than one year's growth or during the period of green foliage for deciduous trees except where the brush is cut down and removed a stump treatment method may be used on the remaining stumps at any time of the year.

11. No application of pesticides containing sodium arsenite shall be made on exposed vegetation of this State without prior approval of the Board.

12. No application of pesticides shall be made to rights of way, including but not limited to power transmission and distribution lines, gas pipeline, railroad, public road, of the state without prior approval of the Board or its designated agent.

REGULATIONS - ECONOMIC POISONS LAW - RSA 438, HB 138 - PERTAINING TO THE LICENSING OF PESTICIDE DEALERS:

Definitions:

1. Commissioner - the New Hampshire Commissioner of Agriculture.

2. Board - means the New Hampshire Pesticides Control Board as established by RSA 149-D.

3. Pesticides - term used synonymously with Economic Poison - any substance or mixture of substances intended for preventing, destroying,

repelling, or mitigating any insects, rodents, fungi, weeds, or other forms of plant or animal life or viruses, except viruses on or in living man or other animals, which the Commissioner shall declare to be a pest, and any substance or mixture of substances intended for use as a plant regulator, defoliant or dessicant.

4. Pesticide Dealer - any person representing himself or a single firm, corporation, dealership or other entity who is engaged in the business of distributing, selling, offering for sale or holding for sale, in New Hampshire, any pesticide which has been designated by the New Hampshire Pesticide Control Board to be "Prohibited-Limited Use" or "Restricted".

Licensing:

A. Pesticide dealers as defined above must be licensed. A licensee shall be required for each location or outlet from which such economic poisons or pesticides are distributed, sold, held for sale, or offered for sale.

B. Salesmen and manufacturers' representatives selling pesticides directly to the consumer are considered Dealers and are subject to the above regulations.

C. Dealer shall designate one or more persons who will be handling pesticides to act on the behalf of the dealership in the licensing process.

D. Dealers must make application on forms prescribed by the Commissioner and be accompanied by a ten dollar annual license fee. Licenses will be renewed annually.

To be included on form:

1. Firm name and name of each licensee
2. Principal business address.
3. Name of employee or officer in the State authorized to receive and accept summons, etc.
4. Any other information prescribed by the Commissioner.
5. Name of person or persons designated by dealer to handle pesticides.

E. Prior to issuance of a license, a pesticide dealer must satisfy the Commissioner as to his knowledge of the laws and regulations governing the use and sale of, and the safe handling of "Prohibited-Limited Use" and "Restricted" pesticides, by passing a written and/or oral examination administered by the Commissioner and/or his designee.

F. Each dealer shall be responsible for the acts of those people in his employ and the dealer's license shall be subject to denial, suspension or revocation for any violation of the chapter, whether committed by the dealer or his office, agent or employee.

G. Licensed Dealers shall maintain a record of their pesticide sales and shall submit on forms provided by the Commissioner an accurate report of their pesticide sales for the year, when applying for a license renewal, or prior to renewal if requested by the Commissioner.

REGULATIONS - RSA 149-D, HB 64 - PERTAINING TO THE SALE AND USE OF PESTICIDES.

III-A. Prohibited, Prohibited-limited use, and Restricted Pesticides - the sale and use of pesticides which the Board finds to be injurious to man or other living things other than those the pesticides are intended to control, is prohibited or restricted as follows:

1. All uses of pesticides restricted or prohibited by the Pesticide Regulations Division of the U. S. Environmental Protection Agency as adopted and published in the Federal Register will apply automatically to New Hampshire.
2. The sale and use of the following compounds is prohibited in the State of New Hampshire. No permitted uses are allowed. (See the latest New Hampshire "State Restricted Use Pesticide List" for an updated list of prohibited compounds in the State.)
3. The sale and use of the following "Prohibited-limited use" compounds is restricted in the manner indicated. These materials may be distributed, sold, offered for sale or held for sale only for the following uses, after license requirements are met. (See the latest New Hampshire "State Restricted Use Pesticide List" for an updated list of prohibited-limited use compounds in the State.)

III-B. Designating Those Types of Commercial Establishments Where Particular Pesticides May Be Sold

For the purpose of controlling their sale, the following pesticides, designated "Restricted," may be sold only by those persons and establishments licensed to sell pesticides by the Commissioner of Agriculture as authorized by RSA 438 for any uses listed on the approved label, as registered with the New Hampshire Department of Agriculture.
(See the latest New Hampshire "State Restricted Use Pesticide List" for an updated list of restricted compounds in the State.)

III-C. Requirements

Applicants for Dealer licenses to sell "Prohibited-limited use" or "Restricted" pesticides must satisfy the following requirements prior to issuance of a license:

(A) Applicant must satisfy the Commissioner or Board that he possesses adequate knowledge of the laws and regulations governing the safe handling, use and sale of "Prohibited-limited use" and "Restricted" pesticides, by passing a written and/or oral examination administered by the Commissioner or Board.

(B) "Prohibited-limited use" or "Restricted" pesticides shall not be displayed for self-service.

(C) Applicant must have adequate facilities for the storage and distribution of "Prohibited-limited use" and "Restricted" pesticides - namely, a room isolated for the sole use of pesticide storage and with means to keep such room locked.

(D) Each dealer shall designate at least one person who is responsible primarily for the handling, distributing, and selling of pesticides.

(E) It shall be unlawful for a dealer to sell "Prohibited-limited use" or "Restricted" pesticides except to those people who hold and present a currently valid Supervisory Certificate of Registration or a Permit to Apply Pesticides as issued by the Board.

(F) Dealer shall maintain all records pertaining to the acquisition, sale or disposal of "Prohibited-limited use" or "Restricted" pesticides and make these records available to the Commissioner or his designee on an annual basis on or before December 1st, on forms prescribed and made available by the Commissioner.

(1) All records required under this section shall be kept and made available, upon request, for inspection by the Commissioner or his designee.

(G) All pesticides or economic poisons distributed, sold, held for sale or offered for sale in New Hampshire must have prior registration with the New Hampshire Department of Agriculture under RSA 438 - Economic Poisons Law. Pesticide materials other than those designated as "Prohibited", "Prohibited-limited use" or "Restricted" provided they are registered with New Hampshire Department of Agriculture, may be sold without license requirements.

IV. Disposal of Pesticides and Pesticides Containers

1. No pesticide containers shall be disposed of in any place other than at an approved refuse disposal site, or in a municipal incinerator. Reusable containers may be disposed of for uses not prohibited in V. below providing such containers are treated as outlined.

2. Surplus or unused pesticides shall be disposed of by burial with at least 18 inches of compacted cover in such a manner and at such a location within the disposal area that contamination of ground or surface water is prevented.

3. Non-combustible containers of pesticides shall be treated in the following manner before disposal:

a. Pesticide Containers used in connection with organophosphate compounds.

(1) Glass Containers: Break the container and bury the pieces at least 18 inches as noted in 2.

(2) Metal Containers:

One Gallon Cans: Pour one pint of water into the empty cans and add one tablespoon of household detergent. Rotate the can carefully to wet all inner surfaces with the solution. Dispose of the rinse solution by burial as in 2. Punch holes in the top and bottom of the can, crush can before burial.

Five-thirty-and fifty gallon cans or drums: Pour the following mixture into the empty container:
5 gallon drums - 2 quarts water, ½ cup caustic soda (household lye), 2 tablespoons detergent.
30 gallon drums - 3 gallons water, 1 pound caustic soda (household lye), ½ cup detergent.
50 gallon drums - 5 gallons water, 2 pounds caustic soda (household lye), 1 cup detergent.
Rotate containers carefully until all inner surfaces are thoroughly wet. Dispose of the rinse solution by burial as in 2. (CAUTION: Handle caustic soda (household lye) with extreme care. Do not get on skin, in eyes, or on clothing. Read and carefully follow the precautions on the package.) Punch holes in the top and bottom of the container and bury as in 2.

4. Pesticide Containers other than those used in connection with Organophosphate Compounds. Rinse at least twice with suitable solvent. Dispose of rinses by burial as in 2.

V. Re-Use of Pesticide Containers

1. No pesticide containers shall be used for the storage of human or animal food or water nor shall such containers be used for the storage of cooking utensils, dishes or clothing.

2. No pesticide containers shall be used for any other purpose unless such purpose has been approved by the Board and the containers have been properly cleaned.

VI. Protection of Persons applying or Otherwise Handling Pesticides

1. It shall be the responsibility of any person permitted by the Board to apply pesticides to acquaint those working under him with the hazards involved in the handling of pesticides as set forth by the Board or on the pesticide label and to instruct the employees on the proper steps to avoid such hazards.

2. It shall be the responsibility of the employer to provide for the protection of the employees, the necessary safety equipment as set forth by the Board or on the pesticides label.

VII. Reporting Pesticide Use

1. All aerial applications of pesticides shall be reported within seven (7) days following the day of application to the Board in the form and manner prescribed by the Board.

2. All applications of pesticides by registrants or permittees must be recorded simply and accurately and be available to the Board on request.

   Commercial applicators must keep and maintain these records for a period of at least two years whether or not there is a renewal of certification. The following facts must be included in records maintained by both commercial and private applicators.

   a. Area, Site, Crop Treated and its Location
   b. Pesticide and formulation employed
   c. Dosage applied
   d. Method of application
   e. Date or dates of application
   f. Target organisms
   g. The registrants or permittees of the Board who participated.

3. In addition to 2 above, all records pertaining to the application of pesticides, as required under RSA 149-D, shall be made available to the Pesticide Control Board or their designee on an annual basis, for the period ending October 31, on or before December 1, on forms prescribed and made available by the Board.

VIII. Severance Clause

If any article, regulation, paragraph, sentence, clause, phrase or word of these regulations shall be declared invalid for any reason whatsoever, that decision shall not affect any other portion of these regulations, which shall remain in full force and effect; and to this end the provisions of these regulations and hereby declared severable.

* New Regulations January 1, 1970.

Attached, State Restricted Use Pesticide List

STATE RESTRICTED USE PESTICIDES LIST 6/1/76
PROHIBITED - PROHIBITED-LIMITED USE - RESTRICTED PESTICIDES

PROHIBITED - No Sale or Use Allowed

1.	Aldrin	1,2,3,4,10,10,-hexachloro - 1,4,4a,5,8,8a - hexahydro - 1.4 - endo-oxo-5,8 - dimethanonaphthalene
2.	BHC	Benzene Hexachloride, (alpha- or-beta)
3.	DDT	1,1,1-Trichloro-2,2-bis (P-Chlorophenyl) ethane
4.	Dieldrin	1,2,3,4,10,10 - hexachloro-6, 7-epoxy-1,4,4a,5,6,7,8,8a, - Octa hydro - 1,4-endo, Oxo - 5,8 - dimethanonaphthalene
5.	Endrin	1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4-endo, endo-5,8-dimethanonaphthalene
6.	Heptachlor	3a,4,5,6,7,8,8-heptachloro-3a,4,7,7a-Tetrahydro-4,7-endo-methanoindene
7.	Strobane	Terpene polychlorinates
8.	Thallium Salts	Thallium acetate, Thallium Sulfate
9.	Toxaphene	Chlorinated camphene containing 67-69% Chlorine (octachloro derivative of 2,2 -dimethyl-3-methylene Norbornane)

PROHIBITED-LIMITED USE - Restricted to uses as listed below

1.	Avitrol*	4- Aminopyridine - For use by or under the supervision of government agencies, and for use by commercial pest control operators upon issuance of a "Special Use Permit". Not for sale to the public.
2.	Compound 1080	Sodium fluoroacetate -approved for use by a licensed pest control applicator under the direct permission of the State Department of Public Health.
3.	DDD	1,1-dichloro-2,2-bis (P-Chlorophenyl) ethane - approved for use in the control of the red banded leaf roller; on commercial crops only.

NOTE: This list supersedes all previous lists, exceptions, and special provisions previously granted.

4. Lindane	Gamma-benzene hexachloride- the use of lindane has been approved for the control of the following pests: bark and wood borers, white pine weevil (single stem applications only), spruce gall aphids, certain leafminers, aphids, thrips, gall midges, and leaf rollers on trees, shrubs, and ornamental plants, generally. Lindane is approved for use as a seed treatment for the control of soil insects and as a soil application for use against symphylids, fungus gnats sowbugs, and millipedes, and for the control of mange mites and human lice as approved by the State Department of Health. The following type products are registered for general use: a) Home and garden solutions, registered for control of wood boring insects, containing not more than 20% Lindane, packaged in containers not to exceed 1 pt.; b) Pastes for control of wood boring insects containing not more than 2% Lindane and packaged in containers not to exceed 2 oz.; c) Pet supplies - shampoos, flea collars, flea tags, and insecticides not containing more than 1% Lindane.
5. Mercury	And its compounds-limited to use as a turf fungicide and as a dormant application to strawberries to control stem end rot.
6. Rothane	See DDD
7. TDE	See DDD

RESTRICTED PESTICIDE MATERIALS

	Concentration at which pesticide materials become Restricted	
1. Acrylonitrile	In any conc.	Cyanoethylene, Propenenitrile, Vinyl Cyanide, VCN*, Ventrol*, Acroylnitrile

2.	Aldicarb	In any conc.	Temik*, Ambush*, VC21148* Carbamyl, 2-methyl-2-(Methylthio) Propionaldehyde-o-(Methyl Carbamoyl) oxime
3.	Arsenic Compounds-Inorganic	In any Conc. above 2%	
4.	Azinphos Methyl	In any Conc.	Guthion*, Carfene*, Gusathion M*, Bayer 17,147, o,o-Dimethyl-S(4-oxo-1,2,3-benzotrizain-3 (4H)-yl Methyl phosphorodithioate
5.	Bomyl*	In any Conc.	Dimethyl 3-hydroxyglutaconate dimethylphosphate
6.	Cadmium Compounds	In any Conc.	
7.	Carbofuran	In any Conc. Above 10%	Furadan*, Bayer 78537, Nia 10242,2,3- dihydro- 2,2-dimethyl-7-benzofuranyl methylcarbamate
8.	Carbon Disulfide and Carbon Bisulfide	In any Conc.	
9.	Carbon Tetrachloride (In Pesticide Formulation)	In any Conc.	
10.	Carbophenothion	In any Conc. above 3%	Trithion*, Dagadip*, Garrathion* S-((p-Chlorophenylthio)methyl) 0,0,-diethyl phosphorothioate.
11.	Chloropicrin	In any Conc.	Acquinite*, Chlor-o-Pic*, Picfume*, Trichloron, Tromethane, Larvacide, Nemax*
12.	Compound 4072	In any Conc.	Chlorfenvinphos, Birlame*, Sapecron*, Supoma*, 2-Chloro-1-(2,4-dichlorophenyl) vinyl diethyl phosphate
13.	Cyanides	In any Conc.	
14.	Cyclohexamide	In any Conc. above 1.3%	Actidione*, 3-(2-(3,5-Dimethyl-2- oxycyclohexyl) -2-hydroxy ethyl) glutarimide
15.	Dasanit*	In any Conc.	Fensulfothion, Bay 25141, Terracur P*, 0,0-Diethyl 0-(p-(methylsulfinyl) phenyl) phosphorothioate

16.	Demeton	In any Conc.	Systox*, Mercaptophos,0,0-Diethyl 0 (and S)-(2-(Ethylthio) ethyl) phosphorothioates
17.	Dichlorvos	In any Conc. above 1%	Vapona*, Dichlorphos, DDVP, DDVF, Dedevap*, Herkol*, Mafu*, Marvex*, Nogos*, No-Pest*, Nuvan*, OKO*, Phosvit*, 2,2-Dichlorovinyl o,o-dimethyl phosphate. 20% resin strips excepted or other so impregnated resin products not in excess of 20% Vapona.
18.	Dicrotophos	In any Conc.	Bidrin*, Carbicron*, Ektafos*, SD 3562, 3-hydroxy- N,N-dimethyl- cis-crotonamide
19.	Dinoseb	In any Conc.	DNBP*, Chemox General*, Chemox P.E.*, DN-289, DNOSBP*, Dow General*, Elgetal 318*, Kiloseb*, Nitrone C*, Premerge*, Sinox General*, 2-sec-Butyl-4,6 dinitrophenal
20.	Dioxathion	In any Conc.	Delna*, Hercules Ac 528, Navadel*, Ruphos*, 2,3-p-Dioxanedithiol S,S- bis (0,0-diethyl phosphorodithioate
21.	Diphacinone	In any Conc. above 1%	Diphacin*, 2- (Diphenylacetyl)-1,3-indandione
22.	Diquat Dibromide	In any Conc.	Aquacide*, Dextrone*, Reglone* 6,7- Dihydrodipyrido (1,2-a:2, 1-C) pyrazidinium dibromide
23.	DiSyston*	In any Conc. above 2%	DiSulfoton, Thiodameton, Bayer 19639*, Dithiodemeton*, Dithiosystox*, Frumin Al*, Solvirex*, 0,0-Diethyl S-(2-(ethylthio) ethyl) phosphorodithioate
24.	DNOC	In any Conc.	DNC, Elgetal 30*, Nitrodor*, Sinox*, Triacide*, 4,6-Dinitro-o-Cresol
25.	DN-111*	In any Conc.	4,6-Dinitro-o-cyclohexylphenol dicyclohexylamine salt

26.	Dyfonate*	All above 15%	N-2740, 5-7173, o-Ethyl-S-Phenylethylphosphonodithioate
27.	Endosulfan	In any Conc. above 3%	Thiodan*, Chlorthiepin, Cyclodan* Hoe 2671, Insectophene*, Kop-Thiodan*, Malix*, Thifor*, T Thimul*, Hexachlorohexahydromethano -2,4,3-benzodioxathiepin 3-oxide
28.	Endothall	In any Conc.	Accelerate*, Aquathol*, Des-i-cate*, Endothal*, Herbicide 273, Hydrothal*, Niagrathal*, Tri-Endo-Thal*, 7-Oxabicyclo (2,2, 1) heptane -2,3- dicarboxylic acid
29.	EPN	In any Conc.	O-Ethyl-O- (p-nitrophenyl) phenylphosphonothioate
30.	Ethion	In any Conc. above 2%	Ethodan*, Kivet*, Nialate, Embathion, Diethion, O,O,O,O Tetraethyl S,S -methylene bisphosphorodithioate
31.	Ethoprop	In any Conc.	Mocap*, Jolt, prophos, O-Ethyl S, S dipropyl, phosphorodithioate
32.	Ethyl Guthion	In any Conc.	Azinphos-ethyl, Bayer 16, 259, Gusathion A*, O,O-Diethyl S-((4-oxo-1,2,3 benzotriazin-3 (4HO-yl) methyl) phosphorodithioate
33.	Ethylene dibromide	In any Conc.	EDB, Bronofume*, Dowfume*, W-85, Kopfume*, Nephis*, Pestmaster EDB-85*, Soilbrom-85*, 1,2 Dibromoethane
34.	Famphur	In any Conc. above 1%	Famophos*, Warbex*, O,O-Dimethyl O- (p-(dimethylsulfamoyl) phenyl) phosphorothioate
35.	Fenthion	In any Conc. above 1%	Baytex*, Bay 29493, Entex*, Lebaycid*, Queletox*, Tiguvon*, o,o,-Dimethyl o-((4-(methylthio) -m-tolyl) phosphorothioate
36.	Formetanate hydrochloride	In any Conc.	Carzol*, Schering 36056, EP-332, Dicarzal*, m-(((Dimethylamino) methylene) amino) phenyl methylcarbamate and it hydrochloride salt.

37.	Fumarin*	In any Conc.	Coumafuryl, 3(a-Acetonylfurfuryl) -4-hydroxycoumarin
38.	Leptophos	In any Conc.	USC-506, ABAR, Phosvel*, O-(4-Bromo-2,5-dichlorophenyl) O-methyl phenylphosphonothioate
39.	Lethane 384	In any Conc. above 2.5%	Beta-butoxy beta-thiocyano diethyl ether
40.	Metasystox R	In any Conc. above 10%	Oxydemeton-Methyl, Bay 21097, de-menton,-S-methyl sulfoxid, metasystox-S-(2-(Ethylsulfinyl) ethyl) 0,0 dimethyl phosphorothioate
41.	Methidathion	In any Conc.	Supracide, Ultracide, GS-13005, 0,0-Dimethyl-S 2-Methoxy-1,3,4-Thiadiazol-5- (4H)-onyl-(4)-Methyl phosphorodithioate
42.	Methomyl	In any Conc.	Lannate*, S-Methyl N- (methylcarbamoyl) oxy) thiocetimidate
43.	Methyl Bromide	In any Conc.	Bromomethane, Brom-o Gas*, MeBr, Meth-O-Gas
44.	Methyl Parathion	In any Conc.	Parathion-Methyl, Metaphos, Dalf*, Folidol M*, Metron*, Nitrax 80*, Partron M*, Tekwaisa*, 0,0-Dimethyl 0-p-nitrophenyl phosphorothioate
45.	Mevinphos	In any Conc.	Phosdrin*, OS-2046, Phosfene*, 2- carbonethoxy-1 - methylvinyl dimethyl phosphate, alpha related compounds
46.	Mexacarbate	In any Conc. above 2%	Zectran*, 4-(Dimethyl-amino) -3,5-xylyl methylcarbamate
47.	Monitor	In any Conc.	Bay 71628, Ortho 9006, Tamaron*, Methamidophos, 0,S-Dimethyl phosphoroamidothioate
48.	Monocrotophos	In any Conc.	Azodrin*, Nuvacron*, SD9129, Dimethyl phosphate of 3-hydroxy-N-methyl-cis-crotonamide
49.	Nicotine alkaloid	In any Conc.	
50.	Nicotine salts	all concentrations above 40% nicotine expressed as alkaloid	

51.	Oxamyl	In any Conc.	Vydate*, Methyl N', N' -dimethyl -N- ((methyl-carbamoyl) oxy) -1- thiooxamidate
52.	Paraquat	In any Conc. above .2% cation	Gramoxone*, Weedol*, 1,1-Di-Methyl -4,4-bipyridynium cation (usually as the bis (methylsulfate)
53.	Parathion	In any Conc.	Thiophos, Alkron*, Alleron*, Corothion*, E-605*, Ethyl Parathion, Etilon*, Folidal*, Niran*, Orthophos*, Panthion*, Paramor*, Parathene*, Parawet*, Phoskil*, Rhodiatox*, Soprathion*, Stathion*, Thiophos, 0,0 Diethyl 0- nitrophenyl phosphorothioate, Nitrostigmine, Bayer E-605, Phosphorothioic acid
54.	Phorate	In any Conc.	Thimet*, Timet, 0,0-Diethyl S-((ethylthio) methyl phosphorodithioate
55.	Phosphamidon	In any Conc.	Dimecron*, 2-Chloro-2-diethylcarbamoyl-1-methylvinyl dimethyl phosphate
56.	Phosphorus	In any Conc.	White and Yellow
57.	Phostoxin*	In any Conc.	Celphos*, Delicia*, Aluminum phosphides
58.	Pindone	In any Conc. above 3%	Pival*, Pivaldione, Pival, Pivacin*, Pivalyn*, Tri-ban*, 2-Pivalyl-1,3-indandione (and its salts i.e. Pivalyn), Pivalyl Valone*
59.	PMP	In any Conc. above 6%	Valone*, 2-Isovaleryl-1,3-indandione
60.	Propoxur	In any Conc. above 3% **Except impregnated flea collars**	Baygon*, Bay 9010, Bay 39007, Blattanex*, Sendran*, Suncide*, Unden*, o-Isopropoxyphenylmethylcarbamate
61.	Schradan	In any Conc.	OMPA, PestoxIII*, Sytam*, Pestox 3*, Octamethylpyrophosphoramide

62.	Selenium	In any Conc.	And its compounds
63.	Strychnine	In any Conc.	Alkaloid and its Salts
64.	Sulfotepp	In any Conc.	Sulfotep, Bladafum*, Dithione*, Dithio, Thiotepp, Sulfatep, AJP-47, o,o,o,o-Tetraethyl dithiopyrophosphate
65.	Sulfuryl Flouride	In any Conc.	Vikane*
66.	2,4,5-T Salts & Esters	In any Conc.	Dacamine*, Ded-Weed*, Brush Killer, Esteron* 245, Fence Rider*, Farron*, Fruitone A*, Investon 245*, Line Rider*, Reddon*, Tormona*, Tributon*, Weedar*, Weedone*, Brush-Rhap*, 2,4,5- Trichlorophenoxyacetic acid
67.	Tepp	In any Conc.	Bladan*, Kilmite 40*, Tetron* Vapotone*, Tetraethyl pyrophosphate
68.	Warfarin	In any Conc. above 3%	Kypfarin*, Coumafene, Zoocoumarin, W.A.R.F. 42, 3-(a-cetonylbenzul)-4-hydroxycoumarin
69.	Zinc phosphide	In any Conc.	Kilrat*
70.	Zinophos*	In any Conc.	Thionazin, Nemafos*, Nemaphos*, Cynem*, O,O-Diethyl O-2-pyrazinyl phosphorothioate
71.	Mesurol*	In any conc. used for bird control	
72.	Glyphosate	In any conc.	Roundup*

* TRADE NAMES

Chapt. II.

Manual for Pesticide Applicator Certification

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Introduction

Certification of pesticide applicators in New Hampshire is required under both Federal and State Statues. However, when an applicator has become certified by the New Hampshire Pesticide Control Board (NHPCB), he has simultaneously satisfied both the State and Federal requirements for pesticide applicator certification.

This manual is a discussion of the certification process, or the process of determining the competency of the pesticide applicator. Once the applicator has been certified by the NHPCB, he is then issued a license if he is a commercial applicator, or a permit if a private applicator. As a result of the issuance of the license or permit the pesticide applicator is then registered with the NHPCB. The manual is also designed to answer your questions on "What do I have to do to become a certified applicator in New Hampshire? What type of a license or permit do I need? and What are the obligations of a pesticide applicator?"

Classification of Pesticides

Pesticides are chemicals used to destroy, prevent, or control pests They also include chemicals used to attract or repel pests, and chemicals used to regulate plant growth or remove or coat leaves.

Here are the uses of the most common pesticides:

Insecticide: controls insects and other related pests such as ticks and spiders.
Miticide: control mites.
Acaricide: controls mites, ticks, and spiders.
Nematicide: controls nematodes.
Fungicide: controls fungi.
Bactericide: controls bacteria.
Herbicide: controls weeds.
Rodenticide: controls rodents
Orvicide: controls birds.
Piscicide: controls fish.
Molluscicide: controls mollusk, such as slugs and snails.
Predacide: controls predators.
Repellent: keeps pests away.
Attractant: lures pests.
Plant Growth Regulator: stops, speeds up, or otherwise changes normal plant processes.
Defoliant: removes unwanted plant growth without killing the whole plant immediately.
Dessiccant: dries up plant leaves and stems and insects.
Antitranspirant: coats the leaves of plants to reduce unwanted lars (transpiration).

For the purpose of pesticide applicator certification pesticides are divided into two major groups, 1) state restricted use materials and 2) general use materials. In determining whether a pesticide is classified restricted or general criteria such as formulations, toxicity, relative hazard to the user, hazard to the environment, and specialized equipment needed to apply the pesticides are taken into consideration. A copy of the "State Restricted Use Pesticide List" is contained in the manual under the section "State Laws and Regulations".

Prohibited - these materials, as determined by the Pesticide Control Board, cannot be used or sold in the State of New Hampshire. (Please refer to the "State Restricted Use Pesticide List")

Restricted - In this category are those pesticides classified Prohibited-Limited Use and Restricted In order to use these materials the user must pass a written and an oral (in the case of a commercial supervisory license) examination.

Prohibited- Limited Use - the pesticides in this group are those that have limited uses. There uses may be limited to only specific claims on the label, but not necessarily to all claims on the label. The products and there uses are listed on the "State Restricted Use Pesticide List". Persons using these products in a use situation other than those listed are subject to a fine, not to exceed five thousand dollars, under New Hampshire laws.

Restricted - the pesticides in this group are those which have been determined to possess a high degree of hazard to the unskilled user and the environment These pesticides may be purchased only thru a licensed pesticide dealer, and may be applied for any use listed on the product label when applied according to labeled directions. Please note that consideration is given to concentration of the active ingredients. Some materials, such as nicotine may fall into either the "Restricted" group or the "General" use group depending on concentration. In this case, any product containing nicotine in a concentration above 40% would be in the "Restricted" group; while those products with a concentration of 40% or less will fall into the general use group. Persons applying for certification should be familiar with the labeled uses of the product and the percent of active ingredients in each product.

General Use Materials - the pesticides in this group includes all pesticides registered in New Hampshire which are not included on either the "Prohibited-Limited Use List" or the "Restricted Use List".

Revision of Lists - As new products are introduced by manufacturers, a decision will be made as to what class of materials the new products will be sectioned into In addition, all pesticides, and their uses registered with the United States Environmental Protection Agency (EPA) and the State of New Hampshire are subject to change within the classification list. Pesticide applicators need only rely on the New Hampshire list as this will include all materials acted on by EPA.

The following part of the Pesticide Applicator Certification Manual is divided into a private applicator section and a commercial applicator section. Applicants need only study the section that is applicable to them.

Private Applicators

In this section there are two terms which need to be defined. They are "Private Applicator" and "agricultural commodity".

Private Applicator - is an individual who uses or supervises the use of any pesticides, whether they are classified for general use or restricted use, for the purposes of producing any agricultural commodity on property owned or rented by him or his employer, or on the property of another person (if applied without compensation other than trading of personal services between producers of agricultural commodities).

Agricultural Commodity - means any plant, or part thereof, or animal, or animal product, produced by a person (including farmers, ranchers, vineyardists, plant propogators, christmas tree growers, agriculturists, floriculturists orchardists, foresters, or other comparable persons) primarily for sale, consumption, propogation, or other use by man or animal.

The term "private applicator" is very inclusive with the only exemption being "the application of pesticides within, around, under or in the immediate vicinity of buildings by the property owner, providing crops raised therein or thereon are not offered for sale." etc. This is as stated under N.H.R.S.A. 149D:9 - II.

General Use Permit - Private applicators desiring the use only of general use pesticides need to secure an application to apply pesticides on their own crops and premises from the Pesticide Control Division in Room 201 of the State House Annex, Concord, N.H. 03301. (See enclosed sample copy of application and instructions for completing.) This application is completed and sent back to the Pesticide Control Division where it is reviewed by the Pesticide Control Board. When approved the applicant is issued a general use permit. In most situations the application procedure can be completed within a day or two.

Restricted Use Permit - Private applicators wishing to be certified in the use of restricted use pesticides are required to pass a written examination. The written examination covers the following; in which the applicant's practical knowledge should include the ability to:

1) Recognize the most important pests, common to his situation, the damage they cause and what methods there are to control them.

2) Read and understand labels and labeling information including the commonly used name of the pesticide applied, the pest(s) controlled by it, safety precautions to be taken, disposal or storage procedures specific to the pesticide used, timing and methods of application, any pre-harvest or re-entry restrictions.

3) Apply pesticides in accordance with label instructions and warnings, including general knowledge of formulations, calculations for preparations of proper concentration of pesticide to be used under particular circumstances taking into consideration such factors as area to be treated, speed equipment will be driven, and quantity to be dispersed per unit of time.

4) Recognize local environmental situations to be considered to avoid contamination to the applicator, bystander, consumer, livestock, wildlife, adjacent crops, water, etc.

5) Recognize poisoning symptoms and procedures to follow in case of a pesticide accident.

Upon having reviewed the above study areas and completed studying the entire core manual you are ready to file an application. A call five days in advance to the Pesticide Control Division (Room 201, State House Annex, Concord, 03301, tel. 271-3550) will in most cases assure that you will be able to file an application and take the examination on the same day. Applicants will be notified in writing as to the results of the exam, usually within 5 days from the date of the exam. Persons passing the examination will be issued a "restricted use permit". On this permit will be the applicator's permit number which will read R- (number) . This permit must be shown (never relinquish to the dealer, always retain the permit) to the pesticide dealer when purchasing the "Prohibited-Limited Use" or "Restricted Use" materials. Restricted use pesticides cannot be bought without the permit.

Single Purchase/ Single Use Permit - is a permit which authorizes the private applicator to make a single purchase for a single use of a restricted use product on a one time basis. However, this permit can only be used by a general use permit holder in an emergency situation. This allows the general use applicator to purchase a restricted use pesticide without a written examination. An example, would be a vegetable grower who suddenly finds himself with a new pest which requires. a restricted use material for eradication. Upon such a find the applicator could go to his county extension agent who would certify him for the specific use of that material and issue the permit. Any person using this permit will be automatically required to take the written examination for the use of restricted use materials by the 1st of January following issuance of the single purchase/single use permit.

Application - This section of the manual is a review of the information needed to complete the application for a permit to apply pesticides. Please find a copy of the private applicator application at the end of the manual, this is only a sample copy and is not to be used for application purposes. In completing an application please fill out all twelve sections.

Section I. Please give your full name as you would like it on the permit; your mailing address should be that of your business; if your "legal residence" or home address is different include both, if it is the same as your business address, indicate so.

Section II. - Be sure to list all properties where pesticides are applied. Also, list each crop, if you apply on corn, beets and beans put such and not just vegetables. Be sure to list approximate acreage for each of the crops.

Section III. For purposes of explanation several imaginary products have listed; these products however, closely resemble products currently registered with the New Hampshire Pesticide Control Board. This report is not a list of pesticides purchased, but a list of all, restricted and general use, pesticides applied.

Column I - List the complete labeled name of the material used; if it is "We-Kil LV4," list it as such and not just "We-Kil", or be sure to put "Moreland General Purpose Spray" and not just "Moreland" or "General Purpose Spray". Brand names or trade names are not sufficient to identify the active ingredients of a product. Also, many different products are frequently sold under the same trade name, like Isotox. Therefore, accepted common names (like carbaryl, the common name for Sevin) or, where common names are not available, the chemical name (like 1-Naphthyl-methylcarbamate, the chemical name for Sevin) is listed in the ingredients statement and the percent concentration of each active ingredient is indicated.

Column 2 - List the concentrations of all active ingredients. In the case of "Moreland General Purpose Spray" (refer to enclosed label) you would write down methoxychlor-12.0%, Captan-8.0%; Malathion-4.0%. If the material is "Smith Sevin Garden Spray" the concentration of the active ingredients in carbaryl-50%. The concentration of many herbicides are given in percent and by lbs. of active ingredients per gallon. (See sample We-Kil LV4 label) In this case you would enter the figure of 2,4-D; 4 lbs. acid/gal. in the second column.

Column 3 -The third column is used to report the particular formulation you used for a single use situation. (See label of We'Kil LV4) Following labeled directions under "Site, Preparation, Budbreak Spray", if you used a formulation of 4 quarts "We-Kil LV4" to 15 gallons of water per acre you would enter 1 gal./15 gal. of water in this column.

Column 4 - This column is not to be misconstrued to mean all the Sevin, 50% wettable powder used during the year. This column is for the total amount of unmixed pesticide for a specific formulation or use situation. If you applied a formulation of 2 lbs./100 gal. water at five different times then you would total this up and enter 10 lbs. If, however a different use situation specifies 3 lbs./100 gal. of water, then this use should be entered seperately.

As a supplement to this section we will examine a product used in a greenhouse situation, and one used on golf course turf. Greenhouse: (see copy of "Plant-Kil" label enclosed in back of manual) In column one you would enter "Plant-Kil 103 Smoke Generator"; column 2, Tetraethyl Dithiopyrophosphate-15%; column 3, enter the size 5,000 cu. ft. or 10,000 cu. ft.; column 4 enter here the number of individual "bombs" used, not the number of cases. Golf Course: (See copy of "Langes" product label in back of manual) In column one you would enter "Langes OldTurf, Old Insecticide III"; column two, Chlorpyrifos-1.0%. column three, if you were using the product for control of chinchbug, the label indicates a "double rate" or 36 3/4 lbs/11,000 sq. ft. which is the figure to enter in column three; in column four, if you used ten bags of Oldturf you would enter 367½ lbs. 10 bags X 36 3/4 lbs./bag (net weight). The compilation of this report should be made easy with the keeping of simple and accurate pesticide application records. See the New Hampshire Pesticides Control Board Regulations, Section VII.

Section IV. - This section is for those initially applying for a permit. Here you should indicate what pesticides (sevin, malathion, 2,4-D, Guthion, etc.) you expect to be using in your operation.

Section V. - If you use or expect to use any pesticides, whose active ingredients is on the "Classified list of State Restricted Pesticides" you should answer accordingly here.

Section VI. - Here you should list the equipment you use, for example: a mist blower, hydraulic sprayer, hand sprayer, ULV sprayer, etc.

Section VII - If this is a renewal license write "renewal". If this is an initial application for a permit indicate the number of years you have had experience applying pesticides.

Section VIII. If you are not a resident of New Hampshire, you will need a person who lives in New Hampshire, and who is authorized by you, to receive and accept services or summonses and legal notices of all kinds for you. Such a person could be a friend, a relative, a lawyer, or arrangements can be made with the New Hampshire Secretary of State's Office for receiving legal papers. However, there is a fee charged for this service.

Section IX. In this section you should furnish the names and addresses of the principle officers of the business. Secondly you should give the name of the person who will be doing the actual pesticide applications. In the case of a small farm the person who is applying for the permit may also be the sole owner of the business and the one applying the pesticides. On the other extreme, a large orchard could have the permit in the name of the manager; there could be additional officers of the firm or corporation listed, and yet have an additional person listed as responsible for pesticide applications, under the direct supervision of the permit holder, in this instance the farm manager.

Section X. This is a very important part of the application. Any deviation, even the slightest, from the manufacturers tested formulations and uses of a pesticide is in direct violation of State and Federal statues. Conviction of such a misuse carries a maximum fine of $5,000. An example would be applying lead arsenate on potatoes for control of the Colorado Potato Beetle; this use is not on the manufacturers label, and is not a registered use in New Hampshire.

Sections XI and XII. Please be sure to sign and date your application. Applications that are received without being signed and dated will be returned to the applicant, thus resulting in a needless delay.

If there are any further questions involving pesticide applicator certificates or any State Laws and Regulations please contact the New Hampshire Pesticide Control Division, Room 201, State House Annex, Concord, N.H. 03301 or call at 271-3550.

Commercial Applicator

Any person applying pesticides on a for hire basis, as a custom applicator must possess a certificate of registration. There are two types of commercial applicators licenses issued in New Hampshire, an operational one and a supervisory one.

Operational - operational certificates are issued to persons who apply pesticides commercially or who are present and in direct command of such persons. The holder of the operational license is usually the person who is making the actual treatment or doing the spraying. An operational applicator cannot purchase "Prohibited-Limited Use" or "Restricted Use" pesticides. The law requires at least one member of each crew to be licensed at this level.

Supervisory - supervisory certificates are issued to persons who are responsible for deciding whether or not pesticides are to be employed, how they are to be used, and the methods of application and pre-cautions to be taken in the use of such pesticides. It is a requirement of law in this state that in order for any business or entity, and its branch offices, to apply pesticides, at least one person at each branch office and the main office must possess a supervisory license, regardless of how many persons hold operational licenses. The holder of a supervisory license must show this license to the dealer upon purchasing any "Prohibited-Limited Use" or "Restricted Use" pesticides.

The following is a description of the pest control categories in which a commercial applicator may become certified in. Applicants should review these categories and note which one(s) they desire certification in. Study manuals for each of these categories are available either through the Pesticide Control Division in Concord, or your nearest county extension office. After determining the category(ies) that is appropriate turn to the section on "Specific Standards of Competency for Each Category of Commercial Applicators" and locate your category(ies). The paragraph there will give you a good idea of the areas in which you will be tested.

Fruit (A-I) applicators who make application of pesticides in the control of pests common to fruit operations, orchards, and small fruit and berry growers, etc.

Herbicides (A-II) applicators who make application of herbicides in the control of vegetative pests associated with crops such as corn, grass crops, and other forage crops.

Field Crops (A-III) applicators who make application of pesticides in the control of pests associated with field crops such as corn, potatoes, beans, and other vegetative crops.

Animals (A-IV) This category includes applicators who make application to animals being grown or maintained for the production of an animal -related agricultural commodity or to structures or areas in or on which such animals are confined. Veterinarians and physicians who apply pesticides to animals or to humans to control various pests, in the course of their normal practice, need not become licensed unless they publicly hold themselves out to be pesticide applicators.

Right-of-Way, Weed and Brush Control (B) this includes commercial applicators using or supervising the use of pesticides for the control of weeds, brush, and other right-of-way pests in the maintenance of public roads, electric powerlines, pipelines, railway right-of-way, or other similar areas.

Forest Pest Control and Timber Treatment (C-I) this includes commercial applicators using or supervising the use of pesticides in forests or forest nurseries, including State and Federal employees operating on public and private lands.

Christmas Trees (C-II) this includes commercial applicators using or supervising the use of pesticides in the maintenance and production of christmas trees.

Aquatic Pest Control (D) this includes commercial applicators using or supervising the use of any pesticide purposefully applied to standing or running water, excluding applicators engaged in public health related activities included in category (E).

Public Health Pest Control (E) this is limited to State, Federal or other governmental employees using or supervising the use of pesticides in public health programs for the management and control of pests having medical and public health importance.

Industrial, Institutional, Structural, and Health Related Pest Control (F-I) this includes commercial applicators using or supervising the use of pesticides in, on, or around food handling establishments, human dwellings, institutions such as schools and hospitals, industrial establishments, including warehouses and grain elevators, and any other structure and adjacent area, public or private and for the protection of stored, processed, or manufactured products.

Mosquito & Black Fly (F-II) This includes commercial applicators using or supervising the use of pesticides for the control of such insects as mosquitoes, black flies, and other biting arthropods in their various habitats.

Shade and Ornamental Pest Control (G-I) this includes commercial applicators using or supervising the use of pesticides to control pests in the maintenance and production of ornamental trees, shrubs, and flowers.

Turf (G-II) this includes commercial applicators using or supervising the use of pesticides to control pests in the maintenance and production of turf, including municipal and private golf courses.

Demonstration and Research Pest Control (H) this includes such persons as extension specialist and county agents, representatives of pesticides manufacturers or distributors and all others who demonstrate pesticides, their use, and application. Also included in this category are Federal, State or other public employees, representatives of private institutions or pesticides manufacturers who conduct field research or supervise the use of pesticides.

Regulatory Pest Control (I) this includes State, Federal or other government employees using or supervising the use of pesticides in the control of recently detected introduced pests or established regulated pests.

Aerial Pest Control (J) this includes commercial and governmental applicators using fixed wing and/or rotary wing aircraft to apply pesticides in the control of various pests.

Seed Treatment this includes commercial applicators using or supervising the use of pesticides on seeds.

STANDARDS OF COMPETENCY FOR CERTIFIED COMMERCIAL APPLICATORS

Applicants applying for a commercial license should be familiar with the general standards, principles and practices associated with pest control and the safe and effective use of pesticides. The Core Manual further discusses and explains in sufficient detail these standards. Applicants who have a practical working knowledge of the total Core Manual should encounter no difficulties in passing the general examination. The general examination is based on problems and situations associated with the following areas:

(A) Label and Labeling Comprehension

(1) General format and terminology;
(2) Understanding of instructions, warnings, terms, symbols, and other information commonly appearing on pesticide labels.

(3) Product Classification - general or restricted;
(4) Necessity for use consistent with the label.

(B) Safety - factors such as:

(1) Toxicity, hazards to man, and common exposure routes;
(2) Common types and causes of pesticide accidents;
(3) Precautions necessary to guard against injury to applicators and other individuals in or near treated areas;
(4) Need for use of protective clothing and equipment;
(5) Symptoms of pesticide poisoning;
(6) First aid and other procedures to follow in case of a pesticide accident; and
(7) Proper identification, storage, transport, handling, mixing procedures and disposal methods for pesticides and used pesticide containers, including precautions taken to prevent children from having access to pesticides and pesticide containers.

(C) Environment - the potential environment consequences of the use and misuse of pesticides as may be influenced by such factors as:

(1) Weather and other climatic conditions;
(2) Types of terrain, soil, and other substrate;
(3) Presence of fish, wildlife and other non-target organisms; and
(4) Drainage patterns.

(D) Pests

(1) Common features of pest organisms and characteristics of damage needed in pest identification;
(2) Recognition of relevant pests; and
(3) Pest development and biology as it may be relevant to problem identification and control.

(E) Pesticides

(1) Types of pesticides;
(2) Types of formulations;
(3) Compatibility synergism, persistence and toxicity of the formulations;
(4) Hazards and residues associated with use;
(5) Factors which influence effectiveness or lead to such problems as resistance to pesticides; and
(6) Dilution procedures.

(F) Equipment

(1) Types of equipment and advantages and limitations of each type; and
(2) Uses, maintenance and calibration.

(G) Application Techniques

(1) Methods of procedures used to apply various formulations, solutions, and gases, including a knowledge of which technique of application to use in a given situation;
(2) Relationship of discharge and placement of pesticides to proper use, unnecessary use, and misuse; and
(3) Prevention of drift and pesticide loss into the environment.

(H) Applicable State and Federal Laws and Regulations

Specific Standards of Competency for Each Category of Commercial Applicators

Applicators should have practical knowledge, as outlined below, in the category(ies) in which they wish to be certified. Study materials for these categories are not included in the Core Manual; category manuals are available thru the New Hampshire Extension Service or the Pesticide Control Division in Concord.

A-I Agricultural Pest Control - Fruit - commercial applicators involved in fruit production must demonstrate a knowledge of crops grown and important pest against which they may be using pesticides. Factors such as the extensive areas involved, the quantities of pesticides needed, and the ultimate use of their commodities as food and feed. Practical knowledge will be required in such areas as soil and water problems, pre-harvest intervals, re-entry intervals, phytotoxicity, and potential contamination to the environment and other non-target areas resulting from the use of pesticides.

A-II Agricultural Pest Control - Herbicides - commercial applicators involved in the application of herbicides in the control of vegetative pests common to field crops must demonstrate a knowledge of crops grown and important vegetative pests against which they may be using herbicides. Factors such as the extensive areas involved, the quantities of pesticides needed, and the ultimate use of commodities treated as food and feed. Practical knowledge will be required in such areas as soil and water problems, pre-harvest intervals, re-entry intervals, phytotoxicity, and potential contamination to the environment and other non-target areas resulting from the use of pesticides.

A-III Agricultural Pest Control - Field Crops - commercial applicators who make applications of pesticides in the control of pests associated with field crops must demonstrate a knowledge of crops grown and important pests against which they may be using pesticides. Factors such as the extensive areas involved, the quantities of pesticides needed, and the ultimate use of commodities as food and feed. Practical knowledge will be required in such areas as soil and water problems, pre-harvest intervals, re-entry intervals, phytotoxicity, and potential contamination to the environment and other non-target areas resulting from the use of pesticides.

A-IV Agricultural Pest Control - Animal - Applicators must demonstrate a practical knowledge of the animals to be treated and their associated pests. A practical understanding is needed of pesticide toxicity as related to these animals and the potential for undesirable or illegal residues in food products. The applicator must know the relative hazards associated with formulations methods of application, age of animals, stresses and extent of treatment. In making applications to structures or areas in or on which animals are confined the applicator must have knowledge of pesticides and application procedures which would minimize the levels of residues on feed products or affect the production of food products.

B Right-of-Way, Weed and Brush Control - Right's-of- way traverse many different terrains, including waterways. Applicants in this category must demonstrate knowledge of problems on runoff, drift, excessive defoliation, and ability to recognize target organisms. They shall also have a practical knowledge of the nature of herbicides and the need for containment of herbicides within the control area to prevent damage to adjacent areas and communities.

C-I Forest Pest Control and Timber Treatment - Applicators must demonstrate a practical knowledge of the types of forests, forest nurseries, and the pests involved. They should also possess practical knowledge of the cyclic occurrence of certain pests and specific population dynamics as a basis for programming treatment. A practical knowledge is required of the selective biotic agents and their vulnerability to the pesticides to be administered in the control program. The applicators must also demonstrate knowledge of control methods that will minimize adverse effect on the environment, including natural aquatic and other wildlife habitats Therefore, the applicant must demonstrate an understanding of the importance of considering material, methods of application, weather conditions, and adjacent areas in minimizing the possibility of adverse effect on non-target areas.

C-II Christmas Tree - Applicators desiring certification in this category must demonstrate a practical knowledge of pests associated with the production and maintenance of christmas trees. This should include knowledge of the life cycles, identification of species, associated host trees, specific pesticides to be used, and time of year when pesticides should be applied for optimum control. Due to the close proximity of woodlands to tree orchards, applicants must demonstrate practical knowledge of techniques used to prevent damage to such non-target areas, including wildlife.

D Aquatic Pest Control - Commercial applicators desiring certification in this category must demonstrate practical knowledge of the secondary effects which can be caused by improper application rates, incorrect formulations, and poor applications techniques. They shall also demonstrate practical knowledge of various water use situations and the potential of downstream effects. Further, they shall demonstrate knowledge of the principle of limited area application and the potential for adverse affects on fish, plants, birds, beneficial insects, and other organisms in aquatic environments.

E Public Health Pest Control - to be certified for this category applicants must demonstrate a practical knowledge of vector - disease transmission as it relates to and influences application programs. A wide variety of pests are involved and an applicant must demonstrate knowledge of life cycles, identification of species, habitats, and pesticides suitable for specific situations as a basis for control strategy. Applicants must also demonstrate practical knowledge of a wide variety of environmental conditions since health related pest control may involve indoor and outdoor situations. They should also have knowledge of the importance of non-chemical controls for certain sitations.

F-I Industrial, Institutional, Structural and Health Related Pest Control

Applicants in this category desiring certification must demonstrate practical knowledge of a wide variety of pests, their life cycles, formulations used in their control, and application techniques that avoid contamination and exposure of food, adjacent areas, people, and pets. Due to the potential exposure, and in some situations continuous exposure, of humans, including babies, the elderly, children and pregant women, applicants must demonstrate a practical knowledge of the specific factors which may lead to a hazardous condition. Applicants must also demonstrate knowledge of environmental situations related to health pest control.

F-II Mosquito and Black Fly - applicants must demonstrate practical knowledge of vector - disease transmissions as it relates to and influences some application programs. They must demonstrate a practical knowledge of mosquito and black fly species, life cycles and habitats, and recognize the potential hazards to non-target areas. Also, applicants must demonstrate a knowledge of specific pesticides for control of mosquitoes and blackflies, and an understanding of non-pesticide control methods.

G-I Shade and Ornamental Pest Control - Applicators desiring certification in this category must demonstrate a practical knowledge in the use of pesticides used for the maintenance and production of a wide variety of ornamental trees, shrubs, plantings, and flowers. Also a knowledge of the potential for plant injury, drift, and persistence beyond the time necessary for pest control. Due to the frequent proximity of human habitation during application, the applicant must demonstrate knowledge of control practices which will minimize or prevent hazards to humans, pets, and other domestic animals.

G-II Turf- Persons desiring certification in this category must demonstrate a practical knowledge in the use of pesticides used in the maintenance and production of turf. Also a knowledge of the potential for pest control. Due to the frequent proximity of human habitation during application, the applicant must demonstrate knowledge of control practices which will minimize or prevent hazards to humans, pets, and other domestic animals.

H Demonstration and Research Pest Control - Persons demonstrating the safe and effective use of pesticides must reflect knowledge of a broad spectrum of pesticides, their uses and effects, population dynamics, as well as the problems and situations requiring control measures. In general, these persons must demonstrate a practical knowledge of all standards detailed under "Standards of Competency for Certified Commercial Applicators" A-H and in addition must meet the specific standards of the category(ies) applicable to their particular activity.

Persons conducting field research with state restricted use pesticides must have knowledge of the 'Standards of Competency for Certified Commercial Applicators' as well as any of the specific categories applicable, etc. Applicants in these special categories desiring certification must demonstrate practical knowledge of the principles and practices of pest control and safe use of pesticides. They must also demonstrate practical knowledge of the specific pests, pesticides used, control practices, and environmental implications of pesticide use associated with their specific situation as determined by the State Pesticide Board or its designee.

I Regulatory Pest Control - Applicators shall demonstrate a practical knowledge of regulated pests, applicable federal and state laws relative to quarantine and other regulations of pests, and the environmental impact of pesticide applications to eradicate or suppress such pests. They shall demonstrate knowledge of factors influencing introduction, spread, and population dynamics of relevant pests. Also, they should have knowledge of regulated pests in other parts of the country that might become problems in this state.

J Aerial Pest Control - Applicators desiring certification in this category must demonstrate a practical knowledge of aerial equipment, calibration and techniques used in applying pesticides. Also, they must have practical knowledge of the effects of particle size and formulations of pesticides as they relate to aerial application; this includes rotorwake and wing vortex effects. Due to the nature of aerial application, applicators must show an understanding of methods which will prevent or minimize hazards to ground crews, adjacent non-target areas and wildlife. Applicators in this category must become certified in any category(ies) or sub-category(ies) A-I in which they they apply pesticides.

Seed Treatment - Applicators must demonstrate practical knowledge of types of seeds that require chemical protection against pests and factors such as seed coloration, carriers, surface active agents which influence pesticide binding and may affect germination. They must demonstrate practical knowledge of hazards associated with handling, sorting and mixing and misuse of treated seeds into food and feed channel, as well as proper disposal of unused treated seeds.

Examination of Commercial Applicators

Operational - Commercial applicators wishing to be licensed as an operational applicator must take the written general commercial applicator examination and the operational examination in the category they seek to be certified in. Appointments for examination must be made thru the Pesticide Control Division (Room 201, State House Annex, Concord, 03301, Tel. 271 - 3550) at least 5 days prior to the date the applicator desires to be examined on. Before the examination can be taken an application must be submitted, accompanied with a ten dollar registration fee. Persons failing the examination are required to take the examination over, but no earlier than 15 days from the date that the examination was failed.

Supervisory - Commercial applicators who meet the requirements for admittance to the examination for a supervisory license, as outlined in the New Hampshire Pesticide Control Board Regulations, II-A(3)(e), should make an appointment thru the Pesticide Control Division at least 5 days prior to the date they wish to be examined on. Before the examination can be taken an application must be submitted, accompanied with a ten dollar registration fee. Applicators applying for a supervisory level license must take the general commercial applicator examination and the supervisory category examination in the category(ies) in which they wish to become certified in. Notification of examination results will be made in writing within 5 days from the date of the examination. Persons failing the examination are required to wait at least 15 days before taking a re-examination. Applicators who successfully complete the written examination are then required to take an oral exam with three members of the Pesticide Control Board, arrangements for the oral examination can also be made thru the Pesticide Control Division.

Insurance Certificate - Before a supervisory or operational license can be issued each applicant for registration must show proof of financial responsbility. This must consist of the following minimum insurance coverage:

1. Ground Application:

Public Liability - - - - - $20,000 each person
Public Liability - - - - - $40,000 each occurrence
Property Damage (including
chemical Liability & Completed
Operations) - - - - - $10,000 each occurrence
- - - - - $25,000 aggregate

2. Aircraft Application:

Public Liability - - - - - $50,000 each person
Public Liability - - - - -$100,000 each occurrence
Property Damage (including Chemical
Liability & Completed Operations)
- - - - - $25,000 each occurrence
- - - - - $50,000 aggregate

Be sure that your policy includes coverage for "Completed Operations." This covers you after the job or spray application is completed, the time when most claims arise.

This requirement is usually completed thru issuance of an official "Certificate of Insurance" by the insurance ageny to the Pesticide Control Board. The certificate is usually issued in the pest control companies name and covers all employees of the company.

Applicators do not need both ground and aerial application coverage, unless both services are performed by the company; you need only insure under the applicable heading.

Application

This section of the manual is a review of the information needed to complete the application for registration to apply pesticides on a commercial basis. Please find a copy of the commercial applicator application at the end of the manual, this is only a sample copy and is not to be used for application purposes. When completing the application you should fill out all nine sections, if a section does not pertain to you put "not applicable". Failure to fill out all sections will only result in a further delay of the licensing process.

Section I - self-explanatory

Section II - Note whether you are applying for a supervisory or operational license and the category(ies) in which you wish to be licensed. If you are an operational applicator renewing your license but desire a supervisory one, so state on the bottom margin of the application form. We will arrange for the supervisory examinations.

Section III - First give your full name and your home address; secondly give the firm's name and address that you work out of; thirdly give the "Legal Residence of Firm" or main office address of the firm, if different than listed above.

Section IV - This section is of particular importance if you are applying for the first time. Be sure to fill out, in detail, this section. In order to be admitted to examinations at the supervisory level certain requirements must be met, see section II-A (3) (c) of the New Hampshire Pesticide Control Board Regulations.

Section V - If you presently hold a license from any other states please note, and list the type of equipment you use and its capacity. Also, if you apply pesticides in New Hampshire list the type and capacity of equipment used.

Section VI - Regulations referred to are under section II-A (4) of the New Hampshire Pesticide Control Board Regulations. Insurance certificates are fully explained under said section of this manual.

Section VII - In this section you should furnish the name or names and addresses of the principal officers of the business. Secondly you should give the name of the person or persons who will be doing the actual pesticide application. In the case of a small commercial operation the person who is applying for the license may also be the sole owner of the business and the one applying the pesticides. On the other end, a large corporation could have a supervisory license in the name of the district branch manager: the principal officer listed of the corporation could be from out of state, and yet the person actually applying the pesticides could be an additional person possessing an operational license.

Section VIII - If you are not a resident of New Hampshire, you will need a person who lives in New Hampshire, and who is authorized by you, to receive and accept services or summonses and legal notices of all kinds for you. Such a person could be a friend, a relative, a lawyer, or arrangements can be made with the New Hampshire Secretary of State's Office for receiving legal papers. However, there is a fee charged for this service.

Section IX - Please be sure to sign and date your application. Applications that are received without being signed and dated will be returned to the applicant, thus resulting in a needless delay.

Pesticide Use Report

A "Pesticide Use Report", as required by New Hampshire RSA 149-D:4 (I), shall be filed by each business entity or corporation. This report should be filed at the same time you apply for a renewal of your license. In the back of the manual there is a sample copy of the report form.

Section I - Give the name of the person or business entity that this report covers, and the address of the firm.

Section II - List here all persons in the company or branch office holding current licenses in New Hampshire who would be affected by this report.

Section III - For purposes of explanation several product names have been listed, this is not to be construed as an endorsement for these products by the New Hampshire Pesticide Control Board. Your pesticide use report is not a list of pesticides purchased, but a list of all pesticides applied.

Column I - list the complete labeled name of the material used; if it is "We-Kil LV4" list it as such and not just "W-Kil"; or be sure to put "Moreland General Purpose Spray" and not just "Moreland" or "General Purpose Spray". A third example would be "Smith Sevin Garden Spray". Copies of these labels are enclosed in the back of the manual.

Column 2 - list here the concentration of all active ingredients. In the case of "Moreland General Purpose Spray" you would write down Methoxychloro-12.0%; Captan-8.0%; Malathion-4.0%. If the material is "Smith Sevin Garden Spray" the concentration of the active ingredient is Carbaryl -50%. The concentration of many herbicides are given by percent and by lbs. of active ingredient/gal. (See sample We-Kil LV4 label). For all herbicides you should report the pounds of acid per gallon. In this case you would report as stated on the label, 2.4-D 4 lbs. acid/gal.

Column 3 - The third column is used to report the particular formulation you used for a single use situation. (See sample label of We-Kil LV4) Following labeled directions under "Site Preparation Budbreak Spray", if you used a formulation of 4 quarts We-Kil LV4 to 15 gallons of water per acre you would enter 1 gal. (4 qts.)/15 gal. of water in this column.

Column 4 - This column is not to be misconstrued as to mean all the Sevin 50% Wettable powder (or other material) used during the year. Entered in this column is the total amount of unmixed pesticides for a specific formulation. If you applied a formulation of 2 lbs/100 gal. 5 times, then you would total this up. If, however, a different use situation specified 3 lbs/100 gal. of water and it was used 10 times, then a total of 30 lbs. unmixed pesticide would be entered.

Column 5 - List here the total amount of pesticide mixture used. See example on sample "Pesticide Use Report".

The compilation of this report should be made easy with the keeping of simple and accurate pesticide application records. See the New Hampshire Pesticide Control Board Regulations, Section VII for details.

Renewals

All applicators currently holding a valid license or permit may renew such certificates for the next year without taking another examination, unless the Board determines otherwise. However, if a renewal is received after June 1st then the applicant is required to go thru the complete examination process. All commercial applicators renewals (operational and supervisory) must be accompanied with a 10 dollar registration fee, and an official "Insurance Certificate". All renewals must include pesticide usage reports. Every five years from the date of the original issue of a commercial license or a private applicator restricted use permit, the applicator is required to attend a seminar, in the category or commodity group with which the applicator is associated with, to familiarize himself with new application techniques, new pest control methods in the applicator's category, new developments in equipment, and precautionary techniques used in the safeguard of the environment. These seminars are held every year and must be attended in either the 4th or 5th year of the 5 year period. Notice of these seminars will be published as "State Pesticide Control Board Approved Seminars" through New Hampshire Extension SErvice media and other state wide media. Certificates will be issued upon completion of the seminar. This certificate must be presented with the renewal application in the fifth year for renewal. In lieu of attending a seminar an applicator may take an examination; a passing grade is required before the license or permit can be renewed.

Record Keeping and Reports

Private applicators, both general and restricted use permit holders, and all commercial applicators must keep accurate records of all pesticide applications they make in New Hampshire. These records should be kept simply and accurately, and should include the following information:

a. Area treated
b. Pesticide and formulation employed
c. Dosage applied
d. Method of application
e. Target organism
f. Date or dates of application
g. The registrants or permittees of the Board who participated.

These records may be requested by the Board for review at any time. Reports of all pesticides used are required on renewal applications for permits and licenses. Information includes: name of material, concentration used, formulation/mixture of material and total amound of unmixed pesticide used (material as it comes from package or container) for the year. All this information can be compiled from your records of pesticide applications.

Special Use Permits

Certain pesticide application situations in New Hampshire require the issuance of a "Special Use Permit". These permits are issued to applicators who currently hold licenses or permits with the New Hampshire Pesticide Control Board. "Special Use Permits" are required for, and must be obtained from the New Hampshire Pesticide Control Board prior to application of any pesticides in the following use situations:

1. Pesticide applications to woodland areas exceeding 50 acres.
2. Pesticide applications to or in proximity to any surface waters of the state.
3. Aerial applications of pesticides.
4. Pesticide application in watershed areas.
5. Pesticide application to Right-of-Ways.

Permits are obtained by submitting an application to the Pesticide Control Board, at no cost to the applicant. After review of the application, if the proposal is acceptable, a permit will be issued. Applications are available through the Pesticide Control Division Office.

If you have any further questions on any section of the manual, please contact the Pesticide Control Division Office, Room 201, State House Annex, Concord, N. H. 03301, or call (603) 271-3550.

PERMIT PERMIT NO. R-301

NEW HAMPSHIRE PESTICIDES CONTROL BOARD
ROOM 201, STATE HOUSE ANNEX
CONCORD, NEW HAMPSHIRE

APPLICATION FOR PERMIT TO APPLY PESTICIDES TO OWN CROPS OR PREMISES

I. Full name (as it should appear on permit): John R. Smith

Mailing Address: Apple Lane , Penacook, N. H. 03301

Legal Residence: Street: Pine St. Town Concord State N. H.

II Name and location of farms or property where pesticides are to be applied under this Permit. Please list. (Attach appendix if needed)

Name of Property	Location	Crop	No. Acres
Old Fort Rd.	East Concord	Corn	3
" " "	" "	Beans	1
Johnson Hill	Penacook	Apples	5

III. Report of all pesticides used in 1975: List only materials used - attach appendix if needed. Follow example given.

Name of Material	Concentration of Active Ingredients	Formulation/ Mixture	Total amount of unmixed pesticides used (material as it comes from package or container
EXAMPLE Smith Sevin 50W We-Kil 2,4,5-T	EXAMPLE Carbaryl-50% 2,4,5-T 4 lbs. acid/gal.	EXAMPLE 2 lbs./100 gal. water 3 gal./100 gal. oil	EXAMPLE 300 lbs. 45 gal.
Sevin 10 Dust	Carbaryl-10%	10 lbs./acre	120 lbs.
Captan 5 Dust	Captan-5%	50 lbs./acre	750 lbs.
Aatram 20G	Atrazine-6.32% 2-chloro-N-isopropyl acetamilide-13.34%	15 lbs./acre	45 lbs.
Diazinon 14G	0,0-diethyl 0-(2-isopropyl-6-methyl-4-pyremidinyl phosphorothioate	14 lbs./acre	84 lbs.

IV. If this is the first year you have applied for a permit indicate what pesticides you intend to use. Follow example given.

Name of Material	Concentration
EXAMPLE Sevin 2,4,5-T	EXAMPLE 50 W 4 lbs. acid/gal.
Not Applicable	

(APPLICATION MUST BE SIGNED - PLEASE COMPLETE OTHER SIDE)

Name of Material	Concentration

V. Do you use any "State Restricted Use Pesticides"?

YES X NO ______

(Consult enclosed list of State Restricted Use Pesticides)

VI. Type of Equipment you use to apply pesticides:

John Bean Sprayer, Model 25TCP 300 gal., RocoDuster; Granular Spreader 500lbs.

VII. Number of years experience in applying pesticides: *renewal*
(If you are renewing last year's permit write "renewal" instead of number of years experience): ______

VIII. If the applicant is a non-resident of New Hampshire, furnish name and address of a person whose domicile is in the State, and who is authorized to receive and accept services or summonses and legal notices of all kinds for the applicant.

Name	Address
Not Applicable	

IX. If the applicant is an individual, receiver, trustee, firm, partnership, association, corporation or other organized group of persons, whether or not incorporated, please use spaces below for furnishing names and addresses of each member of such firms, partnership, or other entity, and the name of the person charged with the responsibility for the application of pesticides must appear on this application; please note with an asterisk.

Name	Address
Ruth Smith	*Pine St., Concord, N.H.*
** Donald Jones*	*Canal Road, Concord, N. H.*

X. The applicant, in accepting this permit, agrees to follow implicitly the instructions outlined on the manufacturer's label.

XI. Signature of Applicant: *John R. Smith*

XII. Date of Application: *November 30, 1976*

Note: If more information in support of this application can be furnished which would enable the Board to determine your qualifications, please feel free to attach additional sheets.

REGISTRATION NUMBER________

NEW HAMPSHIRE PESTICIDES CONTROL BOARD
ROOM 201, STATE HOUSE ANNEX, CONCORD, NEW HAMPSHIRE 03301

APPLICATION FOR REGISTRATION TO APPLY PESTICIDES COMMERCIALLY

This application, accompanied by a fee of $10.00 payable to the Treasurer of the State of New Hampshire, is to be filled out in full and filed with the Department of Agriculture, Room 201, State House Annex, Concord, N.H. 03301

I. Check one: Application for (renewal) _____ (initial) X registration

II. SUPERVISORY X OPERATIONAL ________

_____ (A-I) Agricultural Pest Control-Fruit
_____ (A-II) Agricultural Pest Control-Herbicides
_____ (A-III) Agricultural Pest Control - Field Crops
_____ (A-IV) Agricultural Pest Control - Animals
X (B) Right-of-Way, Weed and Brush Control
_____ (C-I) Forest Pest Control and Timber Treatment
_____ (C-II) Christmas Trees
_____ (D) Aquatic Pest Control
_____ (E) Public Health Pest Control
_____ (F-I) Industrial, Institutional, Structural and Health Related Pest Control
_____ (F-II) Mosquito and Black Fly
X (G-I) Shade & Ornamental Pest Control
X (G-II) Turf Pest Control
_____ (H) Demonstration and Research Pest Control
_____ (I) Regulatory
_____ (J) Aerial Pest Control

III. Full Name (as it should appear on registration)

Robert J. Hooker

Address: 34 High View Rd. Milford, N.H. 03055

Firm Name if Other Than above: Walden Tree and Lawn Service

Address: 101 West St., Manchester, N.H. 03102

Legal Residence of Firm: Town: New Hampton State Connecticut

IV. If you are renewing registration held last year you may omit information on education and experience. If you have not been previously registered in New Hampshire then complete the following information:

Name of School	Dates Attended	Did you graduate?
Groveton High School	1960-64	Yes
New York School of Agriculture	1964-66	Associates Degree

Experience

With what companies or persons?	Years?	Type of work you did?
White's Lawn Care, Newton, N.Y.	3	Landscaping and spraying
Lincoln Total Tree Care, Lincoln NY	5	Landscaping and Right-of-Way

((PLEASE COMPLETE REVERSE SIDE))

V. In what other states are you registered or do you hold current commercial pesticide applicator's certificate?

No Current License

Type and capacity of application equipment: John Bean High Pressure sprayer 40gpm. Bean Rotomist

VI Insurance Information: (See Regulations regarding minimum coverage requirements. Registration will not be granted unless these requirements are met.)

AN OFFICIAL CERTIFICATE AS ISSUED BY INSURANCE COMPANY SHOWING SPECIFIC AMOUNTS OF COVERAGE MUST ACCOMPANY THIS APPLICATION

VII If the applicant is an individual, receiver, trustee, firm, partnership, association corporation, or other organized group of persons, whether or not incorporated please use spaces below for furnishing names and addresses of each member of such firm, partnership, or other entity and the name of the person or persons charged with the responsibility for the application of pesticides must appear on this application; please note with an asterisk.

Name	Address
Bruce I. Walden	New Hampton, Connecticut
Ralph P. Davis	New Hampton, Connecticut
* Robert J. Hooker	Milford, N.H.

VIII. If the applicant is a non-resident of New Hampshire, please furnish the name and address of a person whose domicile is in the State, and who is authorized to receive and accept services and summonses and legal notices of all kinds for the applicant.

Name of Legal Representative: Not applicable

Address of Legal Representative: " "

IX. Signature of Applicant: Robert J. Hooker

Date of Application: November 30, 1976

Note: If more space is required or if the applicant wishes to present additional information in support of the application, please attach additional sheets.

PESTICIDE USE REPORT YEAR 1976

I. Name of Person or Business Entity Reporting: Walden Tree & Lawn Service

Address: 101 West St., Manchester, N.H. 03102

II. List other Licenses in the organization affected by this report:

Robert J. Hooker

John R. Donaldson

Jerry W. Nelson

III. Please indicate all pesticides, including herbicides, insecticides, fungicides, miticides, rodenticides, nematocides, etc., used for the preceding year.

*Herbicides - Report lbs. of acid per gallon
*Report concentration of Materials Used
*Unmixed Pesticide is just as the material comes from the package

Name of Material	Concentration of Active Ingredients	Formulation/ Mixture	Total Amount of Unmixed Pesticides Used (material as it comes from package or container	Total Amount Mixed Spray
EXAMPLE	EXAMPLE	EXAMPLE	EXAMPLE	EXAMPLE
Smith Sevin50W	Carbaryl-50%	2 lbs./100 gal water	300 lbs.	15,000 gal.
We-Kil 2,4,5-T	2,4,5-T 4 lbs.acid/gal	3 gal./100 gal. oil	45 gals.	500 gals.
Methoxychlor 2 EC	Methoxychlor 25%; 2lbs./gal.	1 gals./ 3 gal. water	500 gals.	2000 gals.
Methoxychlor 2 EC	Methoxychlor 25%; 2lbs/gal.	1 gals/12 gal. water	225 gals.	2700 gals
Kelthane EC	1,1-Bis(chlorophenyl)-2,2,2-Trichloroethanal-18.5% 1.6 lbs/gal.	3/4 qt/100 gal water	3 3/4 gal.	2003 3/4gal
Sevin50 WP	Carbaryl-50%	2 lbs./200gal water	120 lbs.	12000 gals.
Malathion 25WP	Malathion25%	2 lbs./100 gal. water	100 lbs	5000 gals.
Dupont Benlate W.P.	Benomyl-50%	1 lbs./100 gal. water	56 lbs.	5600 gals.

PESTICIDE USE REPORT

Permit Number R- 301 Year 1976

Name of Person or Business Entity Reporting: John R. Smith

Address: Apple Lane, Penacook, N.H. 03301

III. (Continued) Appendix of pesticides use report: List only materials used. Follow example given.

Name of Material	Concentration of Active Ingredients	Formulation/ Mixture	Total amount of Unmixed Pesticides Used(material as it comes from package or container)
EXAMPLE	EXAMPLE	EXAMPLE	EXAMPLE
Smith Sevin 50W	Carbaryl-50%	2 lbs./100 gal. water	300 lbs.
We-Kil 2,4,5-T	2,4,5-T 4 lbs. acid/gal	3 gal/100 gal. oil	45 gals.
Diazinon 14G	0,0-diethyl 0-(2-	5 lbs./acre	15 lbs.
	iso-propyl-6-methyl-		
	4-pyrimidinyl)		
	phosphorothioate		
Guthion 50%	0,0-Dimethyl S-((4-	1/2lbs/100gal.water	15 lbs.
Wettable Powder	oxo-1,2,3-benzotriazin-		
Crop Insectic.	3(4H)- yl-methyl)		
	phosphorothioate-50%		

The following sample pesticide labels do not represent products that are being produced. Their sole purpose is to act as an educational aid for this manual. These labels are not in legal form and should not be used as a reference for actual pesticide application, nor should they serve as an example for the layout of pesticide labels.

New Hampshire Pesticides Control Board

WE - KIL LV4

Broadleaf Postemergence Herbicide

The 2,4-D Low Volatile Ester for Agricultural Weed Control

CAUTION : Keep out of reach of children.
See other cautions on right panel.

Active Ingredients:

2,4-Dichlorophenoxyacetic acid, butoxyethanal ester* - - - - 63.2%

Inert Ingredients - - - - - - - - - - - - - - - - - - 36.8%

* 2,4-Dichlorophenoxyacetic acid equivalent 43.5% by weight or 4 pounds per gallon.

Minor Products, Inc.
Durango, Colorado

EPA Reg. No. - - - - -
EPA Est.- - - - - - - - -

GENERAL INFORMATION:

____
____
____

Uses in Forest Management Conifer Release

____
____
____

Site Preparation: Budbreak Spray: To control alder before planting forest tree seedlings, apply 2-4 qts. We-Kil LV4 in 9 - 15 gallons of fuel oil per acre after alder buds break, but before foliage is 1/4 full size.

Foliage Spray:

____
____
____

For emergency Weed Control In Washington, Idaho, and Oregon

____
____
____

CAUTION : HARMFUL IF SWALLOWED. AVOID CONTACT WITH SKIN, EYES, OR CLOTHING.
Avoid spray drift to susceptible plants such as cotton, beans, tomatoes, and ornamentals as this product may cause injury. Coarse sprays are less likely to drift. Do not use same spray equipment for other purposes unless thoroughly cleaned.

Do not reuse empty containers. Destroy containers by burying in a safe place. Do not burn.

Do not store near fertilizers, seeds, insecticides or fungicides. Under very high temperature, vapors from this product may injure susceptible plants in the immediate vicinity. Do not contaminate water used for irrigation or domestic purposes. Do not use in a green house.

This product is toxic to fish, Keep out of lakes, streams, or ponds. Do not apply where runoff is likely to occur. Do not apply when weather conditions favor drift from areas treated. Do not contaminate water by cleaning of equipment, or disposal of wastes. Apply this product only as specified on this label.

Do not use this product for purposes other than those recommended on this label.

Warranty:

SMITH

makes up to 15 gals.
diluted spray

Sevin*
Garden Spray

FOR Ornamentals, Flowers, Lawns, Fruit Trees and Vegetables

Active Ingredients - By Wt.
Carbaryl (1-naphthyl N-methylcarbamate). 50%
Inert Ingredients -50%

CAUTION: Keep out of reach of children.
See back panel for additional cautions.

Net Weight 6 oz.

Smith Chemical Company
Orrville, Illinois
EPA Reg. No. ....
EPA Est. ....

- -

READ ENTIRE LABEL.USE STRICTLY IN ACCORDANCE WITH LABEL CAUTIONS AND DIRECTION. KEEP PESTICIDE IN ORIGINAL CONTAINER. DO NOT PUT CONCENTRATE OR DILUTE INTO FOOD OR DRINK CONTAINERS.

DIRECTIONS: Use 2 level tablespoonfuls Smith Sevin Garden Spray in 1 gallon of water. For best results, apply with a Smith Spray-Ette. To use, mix designated amount of Smith Sevin Garden Spray in a little water to make a thin paste, then add required amount of water. Do not store diluted spray. Make new dilution for each use.
ROSES, ORNAMENTALS, FLOWERS, SHRUBS, SHADE TREES: Japanese Beetles, Aphids, Bagworm, Gypsy Moth, Elm Leaf Beetle, Certain Leafminers, Rose Slug, Periodical Cicada (17-year locust), Scale Insects, Tent Caterpillars, Blister Beetles, Leaf Rollers, Exposed Thrips- Start spraying when insects or their damage appear. Repeat weekly or as necessary. Do not use on Boston Ivy.

FRUIT TREES (APPLES, PEARS AND PEACHES): Apple Maggot, Plum Curculio, Apple Aphid, Leaf Rollers, Peach Tree Borer, Oriental Fruit Moth, Codling Moth- Make one application between bud break and bloom, a second application at petal fall, and then at 3 to 4 week intervals for 3 to 4 months as necessary. Apple Maggot- for best control, apply at 10 day intervals. Rosy Apple Aphid- apply before leaves are curled. Do not apply within 1 day of harvest.

VEGETABLES (TOMATOES, EGGPLANT,PEPPERS, CUCUMBERS, SUMMER SQUASH): Pickleworm, Fruitworms, Melon Worms, Hormworms, Fall Armyworms, Corn Borer- apply when insects first appear. Repeat at 7 to 10 day intervals. For Corn Borer control apply thoroughly into the whorls when plant is about knee high. Repeat at weekly intervals until control is achieved.

LAWN INSECTS: Sod Webworm, Fall Armyworms, Earwigs, Grasshoppers, Fleas and Ants- use 3 ounces (18 tablespoonfuls) in 15 gals. water and cover 500 sq. ft. of established lawn. For best results, use a Smith Lawn Sprayer. Mow lawn first and apply after rain or watering. Do not water at least for two days after application. Repeat in 2 or 3 weeks or as necessary.

CAUTION: HARMFUL IF SWALLOWED, INHALED OR ABSORBED THROUGH THE SKIN. Avoid Breathing Dust or Spray, Avoid Skin Contact. Avoid Eye Contact. In case of eye contact, immediately flush eyes with plenty of fresh water. Wash Hands and Face Before Eating. Keep children and animals off treated lawns until these areas are dry.

NOTE TO PHYSICIANS: Emergency Information - call (---)--------. Carbaryl is a moderate, reversible, Cholinesterase inhibitor. Atropine is antidotal. AVOID CONTAMINATION OF FOOD. To avoid possible fruit thinning on apples and foliar injury on McIntosh, do not apply within 15 days after petal fall. Dispose of container promptly when empty.
This product is highly toxic to bees exposed to direct treatment or residues on crops. Protective information may be obtained from your Cooperative Agricultural Extension Service.

NOTICE: Buyer assumes all responsiblitiy for safety and use in accordance with directions.

Note: This product is sold by weight and package is full when packed, but due to fluffy nature the material is inclined to settle.

SEVIN* Trade Mark of Union Carbide Corporation for the active ingredient, 1-naphthyl N-methylcarbamate.

Greenhouse Use Only

PLANT-KIL 103 SMOKE GENERATOR

POISON POISON

Active Ingredients -
Tetraethyl Dithiopyrophosphate - - - - - - - - - - 15%
Inactive Ingredients - 85%

Treats 5,000 cu. ft.
NET WEIGHT - 1 3/4 ozs.

PRECAUTIONARY
STATEMENT

WALLACE PRODUCTS CORPORATION
Greenville, Iowa
EPA Reg. No. - - - -
EPA Est. - - - - - -

- -

DIRECTIONS FOR USE: Close all doors, windows and ventilators tightly. Plug all holes, cracks or openings in glass. Do not fumigate greenhouse if foliage of plants is wet. Maintain temperature of greenhouse between 70° to 80°F. Place each SMOKE GENERATOR in the greenhouse walk upon a tin, brick or overturned flower pot, keeping generators at least two feet away from plants. Remove cap and insert one of the enclosed ignitor strips in each generator to bottom of container, and light strip. Where the greenhouse being fumigated is large enough to require that generators be placed in more than one walk, it is recommended that one person be assigned to light the generators in each walk starting at the end farthest from the exit, so that the fumigation in each walk may start simultaneously and the persons exit from the house simultaneously. The PLANT-KIL SMOKE GENERATOR will commence to smoke immediately and the dose will continue to be effective for several hours. It is recommended that the ventilators of the house be kept closed all night wherever possible to secure maximum killing effect of this application. Ventilate house thoroughly after fumigation, before permitting work to be done there. Ventilate at least two hours. Repeat fumigation every three days until greenhouse is absolutely clean, then fumigate as re-infestation appears. INSECTS CONTROLLED. Spider mites(red spider), aphids, whitefly and some species of mealy bugs, thrips, and soft brown scale on ornamental plants in the greenhouses.

CAUTION: Avoid all inhalation of smoke or fumes. If it becomes necessary to re-enter smoke filled greenhouse wear gas masks approved by U.S.D.A.

SYMPTOMS OF POISONING: Pupils of eyes or eye shrink to "pin-point" size.
A sense of tightness in chest.
Stomach pains.
Vomitting and diarrhea.
Headaches.

ANTIDOTE: Internal: give a tablespoonful of salt in glass of warm water and repeat until vomit fluid is clear. Have victim lie down and keep warm and quiet. Call a physician immediately.

SELLER makes no warranty of any kind, expressed or implied, concerning the use of these products. Buyer assumes all risk of use or handling, whether in accordance with directions or not.

Net Weight One Pound

MORELAND GENERAL PURPOSE SPRAY

(1) Wettable Powder Combination of Malathion, Methoxychlor, and Captan.
(2) Controls Insects, Prevents Certain Diseases.
(3) Mix 1 lb. with 8 Gallons of Water

CAUTION : Keep Out Of Reach of Children
See Back Panels for Additional Cautions.

Moreland Chemical Co., Inc.
New York, New York
EPA Reg. No. ____________
EPA Est. ________________

Active Ingredients: *Methoxychlor - - - - - - - - - - - - - - - 12.0%
Captan (N-Trichloromethylthio-4-cyclohexene-1,2-dicarboximide)- - - - - - - - - - - 8.0%
**Malathion - - - - - - - - - - - - - - - - 4.0%
INERT INGREDIENTS:- - - - - - - - - - - 76.0%
*Equivalent to 10.5% 2,2-bis(p-methoxyphenyl)-1,1,1-trichloroethane and 1.5% other isomers and related compounds.
**0,0-Dimethyl dithiophosphate of diethyl mercaptosuccinate.

-- DIRECTIONS --

Make spray application on listed Flowers, Shrubs, Trees, Fruit Trees and Vegetables before insects become numerous and before diseases become apparent. Mix 8 level tablespoons per gallon of water (1 lb. per 8 gallons of water). Mix thoroughly before using and occasionally during use to assure uniformity of spray mix. For hose-end sprayer, follow manufacturer's directions. Protect plants through the growing season by spraying at 7-14 day intervals and after heavy rains. Do not store diluted spray. Pay particular attention to cover underside of leaves.

MORELAND GENERAL PURPOSE SPRAY is effective for control of the following insects and diseases:
FRUIT TREES: Aphids, Coddling Moth, European Red Mites, Clover Mites, Two Spotted Mites, Willamette Mites, Pear Psylla, Japanese Beetles, Black Cherry Aphid, Tent Caterpillar on APPLES, PEARS, PEACHES, AND CHERRIES, Scab, Curculio on APPLES, Leaf Spot on PEARS, Brown Rot, Curculio, Scab on PEACHES, Curculio, Leaf Spot, Brown Rot on CHERRIES. Apply material directly to the tree when the air is still. For timing of applications, follow fruit tree dust schedule.

SUGGESTED FRUIT SPRAYING SCHEDULE

DELAYED DORMANT--(From firt green on bud to ½ inch leaves) on apple and peach.
PRE-BLOOM--(From first pink to first bloom) on apple,peach,pear and cherry
PETAL-FALL--(When 90% of petals have fallen on all fruits listed above).
SHUCK-FALL--(When half the shucks have fallen from fruit) on cherry & peach
COVER-SPRAY--(2 to 6 applications.) Begin 10 days after petal-fall on apple and pear. Begin 10 days after shuck-fall on cherry and peach. Do not apply to peaches within 21 days of harvest nor to other fruit within

14 days of harvest.

GRUBS: Japanese Beetles, Aphids, Spider Mites, Lacebugs, Azalea Scale, Scurfy Scale, Euonymus Scale, Soft Brown Scale, Bagworms, and Boxwood Leaf Miners on AZALEAS, RHODODENDRONS, ARBORVITAE, JUNIPERS, HYDRANGEAS, EUONYMUS, PIERIS JAPONICA, LILAC, AND BOXWOOD.
NOTE: For Scale Insects and Bagworms on SHRUBS, Make Only dust applications. Do not spray for control of these insects as 2to3 times the normal dosage of this product is required per gallon of water. This would result in excessive clogging of spray nozzles.
NOTE: Do not use on Boston, Maidenhair, Pteris Ferns as well as species of Crassula.
TREES: Spider Mites, Birch Leaf Miners, Holly Leaf Miners, European Pine Shoot Moth, Tent Caterpillars and Aphids on PINE, BIRCHES, HOLLY OAKS, MAGNOLIAS, MAPLES AND SYCAMORE.
FLOWERS: Aphids, Spider Mites, Japanese Beetles, Rose Chafer, Rose Leafhoppers, Leaf Rollers, Rose Slugs, Flea Beetles, Thrips, Tarnished Plant Bugs, Four Lined Leaf Bugs, Whitefly, Asiastic Garden Beetles and Black Blister Beetles on ROSES, GLADIOLUS, DAHLIAS, SWEET PEAS, ASTERS, AND CHRYSANTHEMUMS. Black Spot, Powdery Mildew, Rust, Leaf Spot and Botrytis Flower Blight on ROSES, TUBEROUS BEGONIAS, CARNATIONS, CHRYSANTHEMUMS and PEONIES. Do not apply on Petunias.
VEGETABLES: Fruitworms, Hornworms, Aphids, Spider Mites, Flea Beetles, Colorado Potato Beetles, Early and Late Blight,Anthracnose and Septoria Leaf Spot on TOMATOES, Aphids, Flea Beetles, Colorado Potato Beetles and Lacebugs on PEPPERS And EGGPLANTS. Aphids, Colorado Potato Beetles, Flea Beetles, Leafhoppers, Early and Late Blight on POTATOES. Pea Aphid on PEAS.
NOTE: Make no applications on PEAS 14 days before harvest Make no application on POTATOES 10 days before harvest. Make no applications on TOMATOES, PEPPERS, EGGPLANTS Within 7 days of harvest.
After the time limits set above have passed, an effective fungicide should be used alone, in amanner which would not leave residues in excess of established tolerances.
CAUTION: Harmful if swallowed or inhaled. Avoid breathing dust or spraying mist. Avoid prolonged or repeated contact with skin. Wash thoroughly after using. Do not contaminate feed or footstuffs. Keep out of reach of children. Dispose of empty container. Do not reuse.
This product is toxic to fish. Keep out of any body of water.
WARRANTY: Seller makes no warranty, expressed or implied, concerning the use of this product other than indicated on the label. Buyer assumes all risk of use and/or handling of this material when such use and/or handling is contrary to label instructions.

COOPERATIVE EXTENSION SERVICE

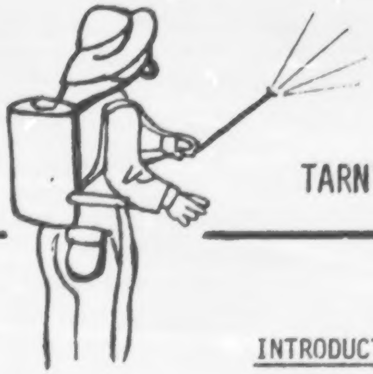
University of New Hampshire

Pest Fact Sheet

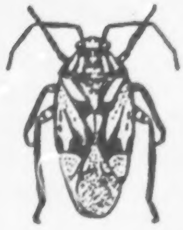
No. 1

PESTICIDE APPLICATOR TRAINING

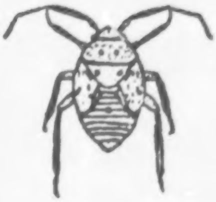
TREE FRUITS - SMALL FRUITS



TARNISHED PLANT BUG



adult



nymph

INTRODUCTION

There are several species of plant bugs that invade our fruit crops, but the one that does the most damage is the Tarnished Plant Bug, Lygus lineolaris. This pest is a serious threat to apple, peach, strawberry, raspberry, grape, and certain vegetables. The feeding of the Tarnished Plant Bug can cause several types of injury - scarred and dwarfed fruit, deformed leaves and fruit, and probably the best known damage is that of catfacing.

DESCRIPTION OF THE TARNISHED PLANT BUG

The Tarnished Plant Bug is a small, brownish, flattened insect approximately 1/4" long, with a piercing-sucking mouthpart. It has a "V" shaped area on the back caused by the overlapping of the wing. The immature stage (nymph) is a yellowish-green oval insect, taking on a similar shape as the adult after five molts. There are 4 round black dots on the back and one on the abdomen. The eggs of the Tarnished Plant Bug are elongate, slightly curved with a flattened edge. This flattened edge is securely attached to the stem of the host plant.

LIFE CYCLE

Unlike most of our economic pests, the Tarnished Plant Bug goes through 3 stages of development: egg, nymph (immature), and adult. It overwinters as an adult under debris, bark, and among leaves of clover, alfalfa, and mullein. The overwintering adult becomes active very early in the spring, attacking the buds of early developing fruit which causes severe injury to the end shoots and will eventually show up as a scar on the fruit. Eggs are laid on an alternate site such as vegetables, weeds, and flowers in the area. Incubation time for the eggs is 10 days upon which the nymph appears. It takes 3-4 weeks for the nymph (immature) to develop to the adult stage. There are three to five generations per year.

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CONTROL

APPLE, PEACH, AND PEAR:

Apple should be sprayed for the Tarnished Plant Bug at ½" green, tight cluster, and pink stages of the fruit development. Sprays on peach should be applied at the pink bud stage, petal fall, shuck split, and 1st cover (7-10 days after petal fall). The spray for pear should be applied at petal fall. The following materials are recommended for apple, peach, and pear:

*Guthion**	50%WP	½ lb/100 gal	½ lb/Acre
Imidan	50%WP	1¼ lb/100 gal	3 3/4 lb/Acre

STRAWBERRY:

Two sprays are required for strawberries: the first is when the blossom clusters in crown are visible and the second is just before blossoms open. The recommended materials are:

*Guthion**	50%WP	5/8 lb/100 gal
*parathion**	15%WP	1 lb/100 gal
Sevin	50%WP	2 lb/100 gal

RASPBERRY:

Only one spray when the new shoots are 5-10" tall is required. Recommended materials and rates are:

*Guthion** 50%WP 1 lb/100 gal & Sevin 50%WP 2 lb/100 gal

GRAPE:

Two applications are needed for Tarnished Plant Bug control on grape. The first is when the shoots are 6-10" long with the second application just prior to bloom. Recommended materials are:

*Guthion** 50%WP 1 lb/100 gal; Sevin 50%WP 2 lb/100 gal;
Imidan 50%WP 1 lb/100 gal

BEAN:

Apply the recommended materials at the first sign of damage:

*Guthion** ½ lb/Acre *parathion** ½ lb/Acre *carbophenothion** 3/4 lb/Acre

* Restricted use pesticide in N.H.

SUMMARY

1.	Damaging Stage:	Adult and Nymph
2.	Part of Plant Attacked:	Buds, Developing Fruit, Leaves, or Berries
3.	Overwintering Stage:	Adult
4.	Number of Generations Per Year:	3-5
5.	Time of Year When Damage Done:	April, May, June
6.	Number of Applications Used:	Apple-3; Peach-4; Pear-1; Strawberry-2; Raspberry-1; Grape-2; Bean-1

SAFE USE OF PESTICIDES

Stop!!! Read the label on every pesticide container each time before using the material. Pesticides must be applied only as directed on the label to be in compliance with the law.

James S. Bowman
Jon P. Turmel

Extension Entomologists

COOPERATIVE EXTENSION SERVICE

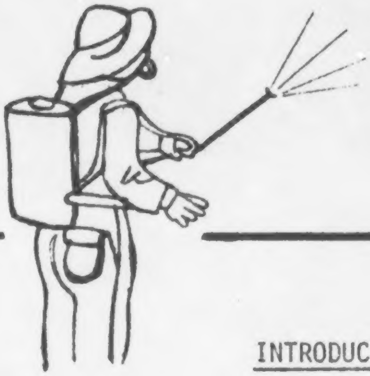
University of New Hampshire

Pest Fact Sheet

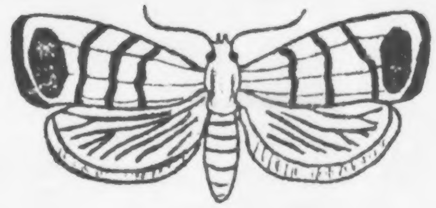
No. 2

PESTICIDE APPLICATOR TRAINING

TREE FRUIT



CODLING MOTH



INTRODUCTION

Once thought of as the most destructive insect pest on apple, this European native now exists wherever apples are grown in the U.S. Since the introduction of chemical controls, this insect has been well controlled, but if left unchecked, it can and has been known to claim up to 95% of a seasons apple crop.

DESCRIPTION OF CODLING MOTH

The adult Codling Moth is a grey colored moth with a brownish black area at the tip of the front wings and faint, wavy, brown crossbands on the rest of the wings. The wing span is from 6-8 mm. The larva ranges in color from cream to pink, a brown head capsule and a speckled shield behind the head. Eggs are colorless to white flat discs, slightly oval in shape.

LIFE CYCLE

The Codling Moth overwinters as a full grown larva in a silken cocoon on the tree or in the ground. Pupation occurs in early spring (late April) and has a duration of about one month. The first adult flight starts approximately the same time the apple trees are in full bloom, but peak flight does not occur until after petal fall. Eggs are laid singly on leaves near the fruit. Incubation takes 7-8 days. Early hatching larvae can be seen about the time of the second cover spray. The larvae may feed on the leaves but will soon enter into the fruit, usually by the calyx (blossom) end. By mid-July, the larvae leave the fruit and pupate either on the tree or in the soil. The second adult flight period then begins in late July-early August with the second larval feeding during August and into September. This second generation usually takes a higher toll of fruit than does the first generation. During the middle of September to early October, depending upon weather conditions, the full grown larva will form a silken cocoon (hibernaculum) and overwinter in this stage.

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CONTROL

Control of the Codling Moth is easily accomplished with the regular spray schedule, which is published annually and can be obtained through the Cooperative Extension Service. The first Codling Moth cover spray occurs from 17-24 days after petal fall (second cover spray) and lasts through the sixth cover spray. The recommended materials and rates are as follows:

			Rate/100 gals.	Rate/Acre
1.	*Guthion**	50%WP	1/2 lb.	1½ lbs.
2.	Imidan	50%WP	1¼ lbs.	3 3/4 lbs.
3.	Sevin	50%WP	2 lbs.	6 lbs
4.	Zolone	3%EC	1½ pts.	4½ pts.

*Restricted use pesticide in N.H.

SUMMARY

1.	Damaging Stage:	Larva
2.	Part of Plant Attacked:	Developing and Mature Fruit
3.	Overwintering Stage:	Fully Grown Larva
4.	Number of Generations per Year:	Two
5.	Time of Year When Damage is Done:	July and August
6.	Number of Applications Per Year:	Five

SAFE USE OF PESTICIDES

Stop!!! Read the label on every pesticide container each time before using the material. Pesticides must be applied only as directed. Avoid inhaling dusts or sprays. Open windows and ventilate the rooms while using pesticides. Never smoke or eat while spraying or dusting. Remove or cover food, feed, water, kitchen utensils and fish and other pets. Do not allow children near you when applying pesticides. Wash and clean up after using pesticides - change clothes if any pesticide was spilled. Dispose of empty containers safely. Bury 18" deep in an isolated area away from any water supply or place in a trash container. Do not burn aerosol cans. Store pesticides in their original containers in a locked cabinet or shed away from food. Be sure tops or caps are on tight. In case of an accident, follow label directions and call a physician immediately.

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Jon P. Turmel
Extension Entomologists

1/76/1.5M

COOPERATIVE EXTENSION SERVICE

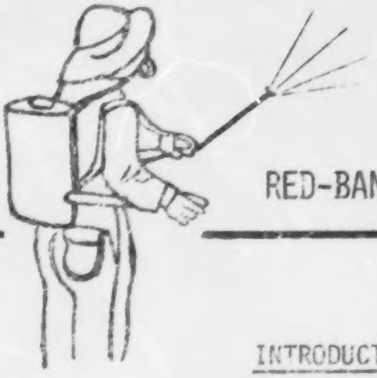
University of New Hampshire

Pest Fact Sheet

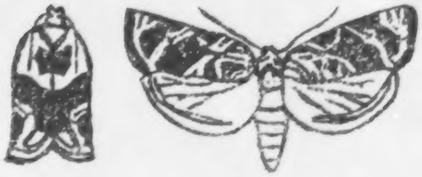
No. 3

PESTICIDE APPLICATOR TRAINING

TREE FRUIT



RED-BANDED LEAFROLLER



INTRODUCTION

The Red-Banded Leafroller is considered the most important tortricid insect pest on spple since the introduction of DDT for Codling Moth control. It is believed that the increase of the Red-Banded Leafroller is due to the decrease of its natural enemies. This pest is widely distributed throughout the Northeast.

DESCRIPTION OF THE RED-BANDED LEAFROLLER

The immature form (larva) of the Red-Banded Leafroller is a small, green, unmarked caterpillar. The color oftentimes varies from ivory to green but depends on what the larva is feeding on. The overall length ranges from 13-18 mm. The pupa is also light green when first developed but gradually darkens to a brown color. Its length is 7-8 mm.

Eggs are found in masses of dull yellowish-orange and the masses are oval in shape. The adult males and females are similar in shape but there are differences in color pattern. The wing span of the adult is from 13-18 mm in length with a color pattern ranging from cream, brownish-yellow to reddish-brown and black. The most striking feature is the reddish brown band in the center of the forewings. When the wings are folded, there is a diamond-shaped marking on the back.

LIFE CYCLE

The Red-Banded Leafroller overwinters as a pupa within folded leaves on the ground. Spring emergence begins at the green tip stage of the tree development and peaks at tight cluster and pink. The adults are considered to be weak fliers, therefore most egg laying will be on the trunk and scoffold limbs of the apple tree. Egg laying starts at the pink stage and continues into bloom. Each egg mass contains 40-45 eggs. Incubation lasts from 14-21 days. Hatching begins as early as bloom but usually peaks at petal fall.

The larvae will immediately start feeding and usually feed on water sprouts but

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will feed on developing apples as time goes along. Development is completed in late June to mid-July and pupation occurs. Adult emergence will begin 10-12 days after pupation to produce a second generation which will last through August. The maturing larva will later spin a silken case using a leaf as a cover. The silk is used as an adhesive between the leaf and fruit. The larval feeding on the fruit is external and seldom does the larva enter the fruit. By late September - early October, they fall to the ground and pupate in the trash where they spend the winter.

CONTROL

There are seven scheduled sprays for the Red-Banded Leafroller. They are:

- Tight cluster
- Pink
- Petal Fall (90% of petals off)
- 1st Cover (7-10 days after Petal Fall)
- 2nd Cover (10-14 days after 1st Cover - for control of the late larvae of the 1st brood)
- 5th Cover
- 6th Cover

The recommended materials and rates are:

*Guthion**	50%WP	½ lb/100 gal	1½ lb/Acre
Imidan	50%WP	1½ lb/100 gal	4½ lb/Acre
Zolone	3%EC	1½ pt/100 gal	4½ pt/Acre

For the 5th Cover Spray, use Sevin 50%WP 2 lb/100.

*Restricted use pesticide in N.H.

SUMMARY

1. Damaging Stage: Larva
2. Part of Plant Attacked: Leaves and Fruit
3. Overwintering Stage Pupa in Leaves or the Ground
4. Number of Generations Per Year: 2
5. Time of Year of Greatest Damage: June, July, August
6. Number of Applications for Control: 7

SAFE USE OF PESTICIDES

Stop!!! Read the label on every pesticide container each time before using the material. Pesticides must be applied only as directed. Avoid inhaling dusts or sprays. Open windows and ventilate the rooms while using pesticides. Never smoke or eat while spraying or dusting. Remove or cover food, feed, water, kitchen utensils and fish and other pets. Do not allow children near you when applying pesticides. Wash and clean up after using pesticides - change clothes if any pesticide was spilled. Dispose of empty containers safely. Bury 18" deep in an isolated area away from any water supply or place in a trash container. Do not burn aerosol cans. Store pesticides in their original containers in a locked cabinet or shed away from food. Be sure tops or caps are on tight. In case of an accident, follow label directions and call a physician immediately.

James S. Bowman
Jon P. Turmel

Extension Entomologists

1/76/1.5M

COOPERATIVE EXTENSION SERVICE

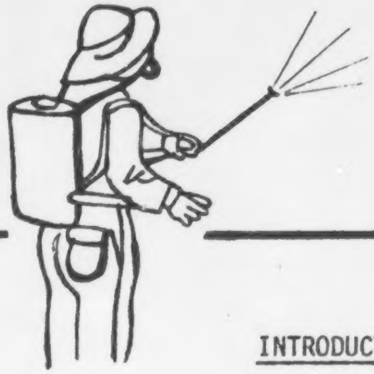
University of New Hampshire

Pest Fact Sheet

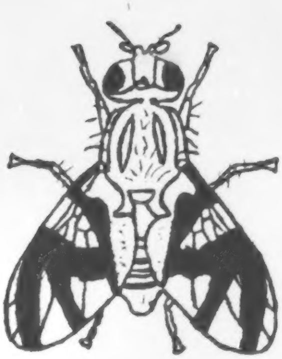
No. 4

PESTICIDE APPLICATOR TRAINING

TREE FRUITS



APPLE MAGGOT



INTRODUCTION

The apple maggot, Rhagoletis pomonella, is considered the most important economic insect pest of apples in New Hampshire. This native pest is also known as the "Railroad Worm." It is a northern pest of apples, ranging from the Dakotas southeast to Arkansas and northeast to southern Canada. If left unchecked, the apple maggot can and has been known to infest 100% of a single seasons apple crop.

DESCRIPTION OF THE APPLE MAGGOT

The adult Apple Maggot is slightly smaller than a house fly, black, and has white bands on the abdomen. The bands are usually 4 in number on the female and 3 on the male. The wings have a pattern of zigzag black bands as seen in the drawing above.

The immature stage is a white, legless maggot which does the damage to the fruit.

The eggs are laid singly in punctures that may appear on the apple skin.

LIFE CYCLE

There is only one generation of Apple Maggot per year in New Hampshire. The Apple Maggot overwinters as a pupa 1-6" in the soil. The adults start emerging early in July (3rd cover spray). Egg laying does not occur until 8-10 days after the fly has emerged. The eggs are deposited in cracks and punctures on the skin of the developing apple. The eggs hatch 5-10 days later and the maggot immediately begins to bore throughout the apple. The maggot feeding resembles a complex system of railroads. That is how the name "railroad worm" has been applied to the Apple Maggot. When the apples drop to the ground, maggot development is rapidly completed and the maggot enters the soil and pupation occurs.

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CONTROL

There are usually 4 or 5 cover sprays on apples in N.H. per season. Apple Maggot sprays start on the 3rd cover spray (35-38 days after petal fall).

The recommended materials and rates are:

*Guthion**	50%WP	½ lb/100 gal	1½ lb/Acre
Imidan	50%WP	1¼ lb/100 gal	3 3/4 lb/Acre
Sevin	50%WP	2 lb/100 gal	6 lb/Acre
Zolone	3%EC	1½ pt/100 gal	4½ pt/Acre

* Restricted use pesticide in N.H.

SUMMARY

1. Damaging Stage: Maggot (Larva)
2. Part of Plant Attacked: Fruit
3. Overwintering Stage Pupa in the Ground
4. Number of Generations Per Year: One
5. Time of Year When Damage is Done: July, August, September
6. Number of Applications Used: Four

SAFE USE OF PESTICIDES

Stop!!! Read the label on every pesticide container each time before using the material. Pesticides must be applied only as directed on the label to be in compliance with the law. Avoid inhaling dusts or sprays. Open windows and ventilate the rooms while using pesticides. Never smoke or eat while spraying or dusting. Remove or cover food, feed, water, kitchen utensils and fish and other pets. Do not allow children near you when applying pesticides. Wash and clean up after using pesticides - change clothes if any pesticide was spilled. Dispose of empty containers safely. Bury 18" deep in an isolated area away from any water supply or place in a trash container. Do not burn aerosol cans. Store pesticides in their original containers in a locked cabinet or shed away from food. Be sure tops or caps are on tight. In case of an accident, follow label directions and call a physician immediately.

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Jon P. Turmel

Extension Entomologists

1/76/1.5M

COOPERATIVE EXTENSION SERVICE

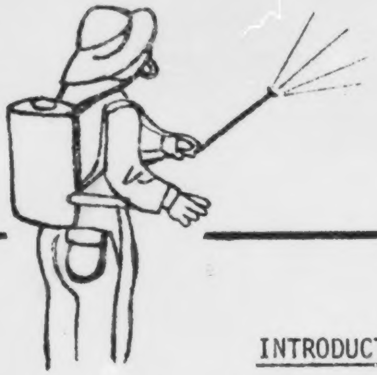
University of New Hampshire

Pest Fact Sheet

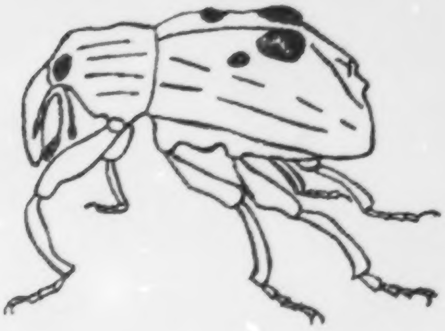
No. 5

PESTICIDE APPLICATOR TRAINING

TREE FRUITS



PLUM CURCULIO



INTRODUCTION

The Plum Curculio is one of the most destructive insect pests of peaches. This native insect is also a problem on apples, plum, pear, cherry, and apricot. It is found in most states east of the Rocky Mountains.

DESCRIPTION OF THE PLUM CURCULIO

The adult Plum Curculio is a small dark brown beetle with a snout that is about 1/3 as long as the body length. The wing covers have four bumps and grayish-white patches. The immature (larva) is a grayish-white, legless, C-shaped grub with a small brown head, and is 1/3" long when full grown. The grub can be found inside infested fruit.

LIFE CYCLE

The adult Plum Curculio overwinters in and near orchards under stones, leaves, in mummified fruit, or along fence rows. In the spring, the adult becomes active and feeds upon the developing fruits and petals. During this time, they mate and egg laying begins. The female will make a small hole in the skin of the fruit, into which she deposits an egg. This hole protects the egg as the fruit develops and expands. One female lays an average of 150 to 200 eggs in one season.

The eggs hatch in 2-12 days and the grub immediately begins to feed on the flesh of the fruit. Most grubs work their way into the center of the fruit. Infested apples usually fall to the ground about the same time as the June drop. If the apple doesn't fall to the ground, the egg probably did not hatch or the grub did not develop. However, the egg scar will be present at harvest time to degrade the quality of the fruit. The larval stage usually takes 2-3 weeks.

When full grown, the grub works its way out of the fruit and into the ground where pupation occurs. The adults emerge about one month later and spend the rest

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of the summer feeding on the fruit. The adult will seek winter shelter in late August-early September. The entire life cycle from egg to adults takes approximately 57 days.

CONTROL

There are 3 scheduled sprays for the Plum Curculio:

APPLE:	1st	Petal Fall (the most important application)
	2nd	1st Cover Spray (7-10 days after petal fall)
	3rd	2nd Cover Spray (10-14 days after 1st cover spray)
PEACH:	1st	Petal Fall (the most important application)
	2nd	Shuck Split
	3rd	1st Cover (10-14 days after shuck split)

The recommended materials and rates are:

*Guthion**	50%WP	½ lb/100 gal	1½ lb/Acre	
Imidan	50%WP	1¼ lb/100 gal	3 3/4 lb/Acre	
Zolone	3%EC	1½ pt/100 gal	4½ pt/Acre	(apple only)

* Restricted use pesticide in N.H.

SUMMARY

1. Damaging Stage: Larva and Adult
2. Plant Parts Attacked: Fruit
3. Overwintering Stage: Adult
4. Number of Generations Per Year: One
5. Time of Year When Damage Done: June, July, August
6. Number of Applications Per Year: Three

NOTE: Some control can be achieved by destroying fruit that has dropped to the ground.

SAFE USE OF PESTICIDES

Stop!!! Read the label on every pesticide container each time before using the material. Pesticides must be applied only as directed on the label to be in compliance with the law. Avoid inhaling dusts or sprays. Open windows and ventilate the rooms while using pesticides. Never smoke or eat while spraying or dusting. Remove or cover food, feed, water, kitchen utensils and fish and other pets. Do not allow children near you when applying pesticides. Wash and clean up after using pesticides -- change clothes if any pesticide was spilled. Dispose of empty containers safely. Bury 18" deep in an isolated area away from any water supply or place in a trash container. Do not burn aerosol cans. Store pesticides in their original containers in a locked cabinet or shed away from food. Be sure tops or caps are on tight. In case of an accident, follow label directions and call a physician immediately.

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Jon P. Turmel

Extension Entomologists

1/76/1.5M

COOPERATIVE EXTENSION SERVICE

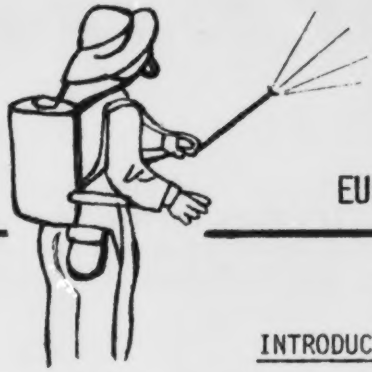
University of New Hampshire

Pest Fact Sheet

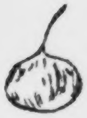
No. 6

PESTICIDE APPLICATOR TRAINING

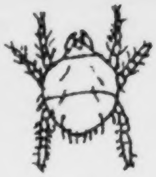
TREE FRUIT



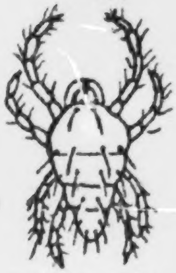
EUROPEAN RED MITE



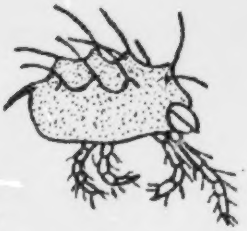
egg



larva



adult male



adult female

INTRODUCTION

This non-insect pest is a European native which was first discovered in the U.S. in 1911. Since that time, it has become one of the most important fruit pests in the U.S. and Canada. Undersized fruit, poor quality fruit, and prevention of bud formation all accompany this pest wherever it goes.

DESCRIPTION OF THE EUROPEAN RED MITE

Eggs of the European Red Mite are bright red to orange in color and spherical in shape with a stalk as long as the egg. They can be found on twigs and young branches of the host plant. The newly hatched young is a 6-legged larva, brownish-red in color. It gradually changes to an 8-legged nymph. The adult female is a bright red color with no spotting. The body is elliptical in shape and about 1/75" in length. On the back, four rows of long, curved spines with white tubercles can be found.

LIFE CYCLE

The European Red Mite overwinters in the egg stage. Hatching occurs in early spring, usually before apple bloom.

The newly hatched young immediately start to feed on the unfolded leaves by sucking out the juices from the leaves. Damage can be found in the form of spotting on leaves, and if severe infestations occur, the whole tree will look as if it were covered with dust. The larva will go through 2 additional stages before becoming an adult.

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The adult stage lasts for about 19 days in which time the female lays an average of 20 summer eggs. Egg development is uninterrupted and a new generation begins immediately. There are from 4-9 generations each year.

CONTROL

APPLE:

At ½" green, tight cluster, and pink bud stages, a Superior Oil of 60-70 sec. viscosity can be used. If oil is omitted from the schedule or as a follow-up to earlier applications, the following acaricides may be used at pink, petal fall, 1st cover, third cover, and fifth cover. Be sure to use these materials according to label instructions.

- *Systox** EC
- Galecron EC
- Fundal SP
- Acaralate EC
- Tedion EC
- Plictran WP
- *Carzol** SP
- Omite WP

To obtain a commercial spray schedule, contact your county agent for a copy of "Northern New England Apple Spray Schedule" Pamphlet #310.

PEACH:

Dormant: Superior Oil, 60-70 sec. viscosity

Delayed Dormant: Superior Oil -- Only if oil was not used in dormant.

* Restricted use pesticide in N.H.

SUMMARY

1. Damaging Stage: Larva, Nymph, Adult
2. Part of Plant Attacked: Developing Buds, Leaves, Fruit
3. Overwintering Stage: Egg
4. Number of Generations Per Year: 4-9
5. Time of Year When Damage Done: May, June, July
6. Number of Applications Used: Apple -- 2 Oil Sprays
   4-5 Acaricides
   Peach -- 1 Oil Spray

SAFE USE OF PESTICIDES

Stop!!! Read the label on every pesticide container each time before using the material. Pesticides must be applied only as directed on the label to be in compliance with the law.

James S. Bowman
Jon P. Turmel

Extension Entomologists

1/76/1.5M

COOPERATIVE EXTENSION SERVICE

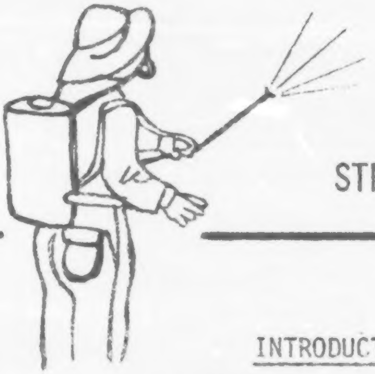
University of New Hampshire

Pest Fact Sheet

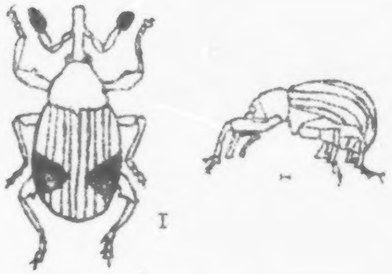
No. 7

PESTICIDE APPLICATOR TRAINING

SMALL FRUIT



STRAWBERRY WEEVIL



INTRODUCTION

The Strawberry Weevil is known by many as the "Strawberry Clipper." It is a native of North America occuring from Texas to New England. When abundant, the weevil will sever stems causing a great amount of damage to the fruit and buds. In some states, 50-75% of the crop is destroyed by the Strawberry Weevil.

DESCRIPTION OF THE STRAWBERRY WEEVIL

The adult is a brown to pitchy-black snout beetle less than 1/10" in length with large dark spots on the wing covers. The larvae of the Strawberry Weevil are glassy white legless grubs and are usually found feeding within the developing strawberry bud.

LIFE CYCLE

The adult Strawberry Weevil overwinters in mulch and leaf trash in and around the strawberry beds. They become active about the time of strawberry bloom. Feeding begins about this time on the buds and foliage. The female will deposit her eggs in holes she has made with her snout about midway between the center of the bud and the tip of the bud. She then will cut off the stem of the bud about 1/4" below the bud. One female will lay 20-30 eggs. The eggs will hatch in 6-14 days, depending upon weather conditions. The larva will feed on the bud and within 29 days will have attained full growth and will have fed upon the entire strawberry bud. Once full grown, it will pupate and emerge as an adult (approximately mid-summer). The adults will feed for a short time and then find overwintering quarters to emerge again the next spring.

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CONTROL

azinophos-methyl (*Guthion*)*	50%WP	5/8 lb/100 gal	
*parathion**	15%WP	1 lb/100 gal	
methoxychlor	50%WP	2 lb/100 gal	can be used for adequate control

Usually, one spray just before blossoms open is sufficient.

* Restricted use pesticide in N.H.

SUMMARY

1.	Damaging Stage:	Adult and Larva
2.	Part of Plant Attacked:	Buds and Foliage
3.	Overwintering Stage:	Adult
4.	Number of Generations Per Year:	One
5.	Time of Year of Greatest Damage:	June
6.	Number of Applications Used:	One

SAFE USE OF PESTICIDES

Stop!!! Read the label on every pesticide container each time before using the material. Pesticides must be applied only as directed on the label to be in compliance with the law. Avoid inhaling dusts or sprays. Open windows and ventilate the rooms while using pesticides. Never smoke or eat while spraying or dusting. Remove or cover food, feed, water, kitchen utensils and fish and other pets. Do not allow children near you when applying pesticides. Wash and clean up after using pesticides - change clothes if any pesticide was spilled. Dispose of empty containers safely. Bury 18" deep in an isolated area away from any water supply or place in a trash container. Do not burn aerosol cans. Store pesticides in their original containers in a locked cabinet or shed away from food. Be sure tops or caps are on tight. In case of an accident, follow label directions and call a physician immediately.

James S. Bowman
Jon P. Turmel

Extension Entomologists

1/76/1.5M

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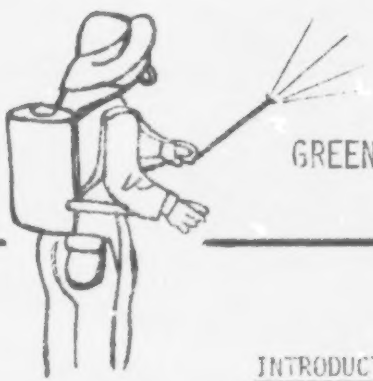
University of New Hampshire

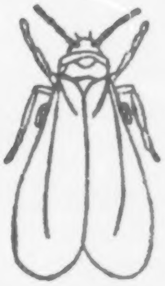
PESTICIDE APPLICATOR TRAINING

Pest Fact Sheet

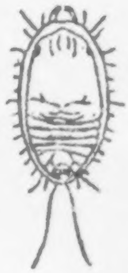
No. 8



GREENHOUSE WHITEFLY



adult



nymph

INTRODUCTION

The greenhouse whitefly, Trialeurodes vaporariorum (Westw.), feeds on a variety of vegatable and floral crops: cucumber, tomato, lettuce, geraniums, pelargonium, salvia, ageratum, lantana heliotrope, fuchsia, hibiscus, abutilon, solanum, and coleus are among the favorites.

DESCRIPTION OF THE WHITEFLY

The eggs are usually found on the undersides of tender leaves. They are very small, oval, light green to yellow-green and are attached to leaves by short stalks.

The newly hatched larva is flat, oval and nearly transparent. The last stage larva has white waxen filaments that radiate from the body. The adult is a small four-winged insect about 1/16th of an inch in length. The wings are snow white and the body is yellow.

LIFE CYCLE

This insect does not overwinter outdoors in N.H. It can only survive the winter in greenhouses. Throughout the year, an overlapping of all stages can be found: egg, larva, pupa, and adult. Damage from whiteflies is two-fold. They suck the juices out of the host leaves, causing a lack of vigor in the plant, an eventual wilting and often the plant will die. They also secrete a sticky material called honeydew upon which a black sooty fungus develops and can eventually cover an entire leaf. This will interfere with the plant's photosynthetic processes, can reduce vigor, and eventually cause death.

The eggs are deposited on the underside of leaves. The female may lay 150 or more eggs at a rate of about 25 per day. Hatching occurs within 10 days. Upon

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hatching, the larva will travel for a while. Then it will insert its beak into the plant tissue and remain there. It will feed for about a month while going through four stages of development. Unlike most sucking insects, the whitefly has a resting stage (pupa) before becoming an adult. The adult also feeds in the same manner as the larva. Mating then occurs and the next generation is begun. Whiteflies complete their life cycle in 21-36 days, depending on the temperature.

CONTROL

Parathion, *Guthion*,* dimethoate (Cygon)	Spray: 3 applications; 7-10 days apart
endosulfan (*Thiodan*)*	Spray: 3 applications; 7-10 days apart
Parathion,* *Vapona*,* Sulfotepp (Dithio)	Aerosol: 6 applications; 4-5 days apart
Resmethrin (SBP-1382)	4 applications; 7 days apart
Aldicarb (*Temik-15-G*)	may be used on poinsettias and chrysanthemums.

NOTE: SPRAYS SHOULD NOT BE USED AFTER BRACT OR FLOWER FORMATION

*Restricted use pesticide in N.H.

SUMMARY

1.	Damaging Stage:	Adult, Larva
2.	Part of Plant Attacked:	Leaves
3.	Overwintering Stage:	Doesn't Overwinter Outdoors in N.H. Usually Remains in Greenhouses Year-Round
4.	Number of Generations Per Year:	Multiple (8-12)
5.	Time of Year When Most Damage Done:	Year Round
6.	Number of Applications Used:	3-6, Depending Upon the Chemical Used And Number of Infestations Per Year

SAFE USE OF PESTICIDES

Stop!!! Read the label on every pesticide container each time before using the material. Pesticides must be applied only as directed on the label to be in compliance with the law.

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1/76/1.5M

COOPERATIVE EXTENSION SERVICE

University of New Hampshire

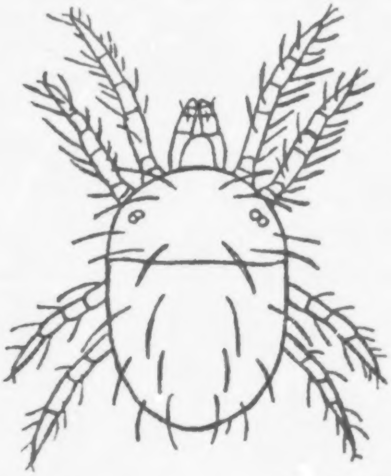
PESTICIDE APPLICATOR TRAINING

GREENHOUSE AND NURSERY

Pest Fact Sheet

No. 9

COMMON SPIDER MITE
(RED SPIDER)



INTRODUCTION

The Common Spider Mite, Tetranychus telarius , also known as the Red Spider, is a well known mite pest in greenhouses. Althougn it feeds on a large number of greenhouse plants, it favors carnation, chrysanthemum, violet, rose, fuchsia, and geranium.

DESCRIPTION OF THE RED SPIDER

The egg of the Red Spider is very small, spherical and pale in color when first deposited, then changes to red as it develops. The newly hatched young is six-legged and a pale pink in color. The first molt produces an 8-legged nymph with a variation of color; green, yellow, orange, carmine, black, and brown. The adult is similar in shape and color as the 8-legged nymph.

LIFE CYCLE

As is the case of most greenhouse pests, the Red Spider does not overwinter outdoors, nor does it have a definite number of generations per year. Eggs are laid in the web of the adult mite. One female lays from 10-50 eggs. The young 6-legged larvae hatch in seven days. Three molts follow, each stage lasting 3-4 days. In these molts, the nymph is 8-legged. The adult stage lasts for 3-4 weeks.

The adults and young both feed by inserting their beaks into the plant tissue and withdrawing the fluids from within. At first, this causes a discoloring of the underside of the leaves and a gradual shriveling and death of the leaves.

When examining a plant for mites, check for small strands of silk on the underside of leaves. This is a good indication of spider mite presence.

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CONTROL

Use the following materials only on the crop it is registered for and at the recommended rate on the label.

*Meta-Systox-R** EC
dimethoate (Cygon) EC
demeton (*Systox*)* EC
aldicarb (*Temik*)* 10G
dithio (*Sulfatepp*)* 5%
*parathion** WP
malathion EC
*Tepp** EC
*Vapona**
Kelthane WP
Pentac WP

For foliar treatments, use these materials on a trial basis first.

NOTE:

*aldicarb** may also be used on poinsettias.
Do not use *Vapona** on asters.
Do not use dimethoate on chrysanthemums.
Do not use *parathion** on hydrangeas.

* Restricted use pesticide in N.H.

SUMMARY

1. Damaging Stage:	Larva, Nymph, Adult
2. Plant Part Attacked	Undersides of Leaves
3. Overwintering Stage	Does Not Overwinter Outdoors in N.H.
4. Number of Generations Per Year	Several
5. Time of Year When Damage Done:	Year Round
6. Number of Applications Per Year:	Variable

SAFE USE OF PESTICIDES

Stop!!! Read the label on every pesticide container each time before using the material. Pesticides must be applied only as directed. Avoid inhaling dusts or sprays. Open windows and ventilate the rooms while using pesticides. Never smoke or eat while spraying or dusting. Remove or cover food, feed, water, kitchen utensils and fish and other pets. Do not allow children near you when applying pesticides. Wash and clean up after using pesticides - change clothes if any pesticide was spilled. Dispose of empty containers safely. Bury 18" deep in an isolated area away from any water supply or place in a trash container. Do not burn aerosol cans. Store pesticides in their original containers in a locked cabinet or shed away from food. Be sure tops or caps are on tight. In case of an accident, follow label directions and call a physician immediately.

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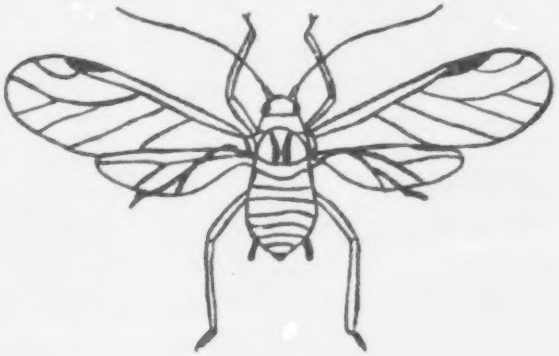
Pest Fact Sheet

No. 10

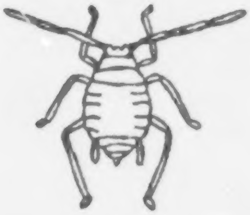
PESTICIDE APPLICATOR TRAINING

GREENHOUSE AND NURSERY

GREENHOUSE APHIDS



Adult



Nymph

INTRODUCTION

Aphids (Plant Lice) are the most common insect pest in N.H. greenhouses. Varying in size, color, and numbers, the N.H. grower is constantly fighting a battle with this small economic insect pest.

DESCRIPTION OF APHIDS

There are several species of aphids that are of economic importance to N.H. growers, the most common being the Green Peach Aphid, Myzus persicae (Sulzer). It is soft-bodied and green in color but others are red, black, and brown. They are insects with sucking mouthparts and are easily distinguished by the two tube-like appendages (Cornicles) that can be found on the posterior end of the abdomen. Adults can be wingless or they can have 2 pairs of transparent wings.

LIFE CYCLE

In greenhouses, all species of aphids reproduce year round. Living young are produced by unmated females. It takes only seven to ten days for the nymph to develop to a reproductive female. This adds to the reproductive capability of the aphid. Each female is capable of producing fifty young.

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Both the nymph and the adult feed on the young tender parts of the plant. They insert their beaks and withdraw the juices. This causes distortion of leaves and buds.

The aphid also secretes a sticky substance called "honeydew." This sweet material attracts ants and sooty fungi. The sooty fungi can discolor the plant enough to make it undesirable for sale.

Aphids are also known to be carriers of many greenhouse disease-causing organisms.

CONTROL

When using the following materials, make sure that the insecticide you use is registered for use on the crop you plan to use it on. FOLLOW THE LABEL!

Sprays:

demeton (*Systox*)*EC
Diazinon WP
dimethoate (Cygon) EC
endosulfan (*Thiodan*)* WP or EC
malathion EC
*Meta-Systox-R** EC
naled (Dibrom) EC
*nicotine** 40%
*parathion** WP
*Tepp** EC
*Vapona** EC
Pirimor WP

Granules:

*Temik** 10G

Aerosol:

dithio (*Sulfotepp*)* 5%
*Vapona**

Soil Drench:

dimethoate (Cygon)
demeton (*Systox*)*
*Meta-Systox-R**

*Restricted use in N.H.

SUMMARY

1. Damaging Stage: Nymph and Adult
2. Part of Plant Attacked: Young Tender Growth of Plant
3. Overwintering Stage: Does Not Overwinter in N.H.
4. Number of Generations Per Year: Several
5. Time of Year When Damage Done: Year Round
6. Number of Applications Per Year: Variable

SAFE USE OF PESTICIDES

Stop!!! Read the label on every pesticide container each time before using the material. Pesticides must be applied only as directed on the label to be in compliance with the law.

James S. Bowman
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Extension Entomologists

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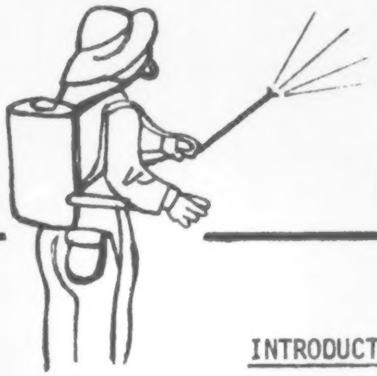
Pest Fact Sheet

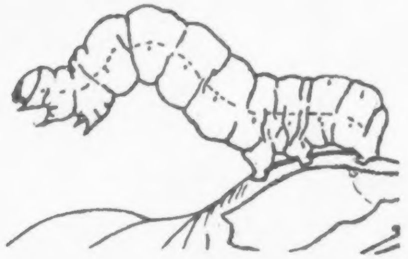
No. 11

PESTICIDE APPLICATOR TRAINING

VEGETABLES



CABBAGE LOOPER



INTRODUCTION

This North American native is found throughout the U.S., Canada, and Mexico. It attacks all plants of the crucifer family, lettuce, spinach, beets, peas, celery, parsley, potato, and some flower varieties.

DESCRIPTION OF THE CABBAGE LOOPER

The larva of the Cabbage Looper, Trichoplusia ni Huebner, is a small green caterpillar with a thin white to yellow stripe on each side of the body and two stripes down the center of the back. It has three pairs of legs near the head and three pairs of club-shaped legs (prolegs) on the abdomen. The area between these legs is usually humped into a loop during movement, thus, deriving its name. The adults are about an inch in length, are a gray-brown color, and have a wing span of an inch and one half. The middle of the front wings have a silvery spot that resembles a figure 8.

The eggs are found singly on leaves. They are spherical and greenish-white in color. The pupa ranges in color from green to brown, is about 3/4 of an inch in length, and is found within a white thread cocoon on the leaf of the host.

LIFE CYCLE

The Cabbage Looper does not overwinter outdoors in N.H. It flies up from the south in mid to late July. This accounts for the overlapping of all stages in N.H.

Once the adult reaches N.H., eggs are laid singly on the upper surfaces of the host plant. Each female lays 275-350 eggs. Upon hatching, the larva immediately feeds upon the host plant and completes development in 2-4 weeks. Pupation also occurs on the host plant. The pupa can be found enclosed in a network of white threads on the host plant. The adult then emerges in 2 weeks. This cycle occurs 2-3 times per season.

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CONTROL

Cabbage Looper sprays usually begin as soon as the eggs and larva are present. This is usually late July. Complete coverage of the crop is necessary for adequate control.

CABBAGE, BROCCOLI, CAULIFLOWER:

Weekly applications of the following is recommended:

endosulfan (*Thiodan*)*	1 lb/Acre	Biotrol XK	1-2 lb/Acre
naled (Dibrom)	1½-2 lb/Acre	*methomyl* (*Lannate*)*	1 lb/Acre
Thuricide HPC	2 qt/Acre	*Monitor**	1 lb/Acre
Dipel	½-1 lb/Acre		

LETTUCE:

Once again, complete coverage of the crop is necessary.

naled (Dibrom)	1-2 lb/Acre	Dipel	½ lb/Acre
methomyl (*Lannate*)*	1.0 lb/Acre	Thuricide HPC	2 qt/Acre
		Biotrol XK	2 lb/Acre

Be sure to check days to harvest for each pesticide and crop.

* Restricted use pesticide in New Hampshire.

SUMMARY

1. Damaging Stage: Larva
2. Plant Parts Attacked: Leaves and Vegetable
3. Overwintering Stage: Does not Overwnter in N.H. Flies North from the South
4. Number of Generations Per Year: 2-3
5. Time of Year When Damage Done: July - October
6. Number of Applications Per Year: 7-9

SAFE USE OF PESTICIDES

Stop!!! Read the label on every pesticide container each time before using the material. Pesticides must be applied only as directed on the label to be in compliance with the law.

James S. Bowman
Jon P. Turmel

Extension Entomologists

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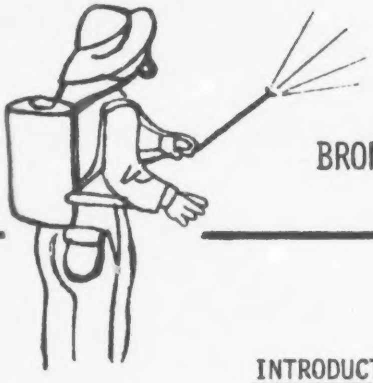
Pest Fact Sheet

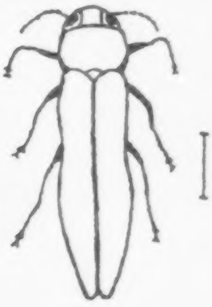
No. 12

PESTICIDE APPLICATOR TRAINING

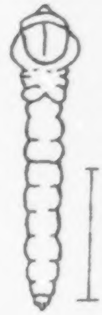
GREENHOUSE AND NURSERY



BRONZE BIRCH BORER



adult



larva

INTRODUCTION

The Bronze Birch Borer, *Agrilus anxius* Gory, is found throughout the birch range in the U.S. and Canada. It attacks and breeds in Paper Birch, Yellow Birch, Gray Birch, Western Paper Birch, Water Birch, Sweet Birch, and it has been found in stands of beech and aspen. Paper and Yellow Birch are the preferred hosts.

DESCRIPTION OF THE BRONZE BIRCH BORER

The larvae of the Bronze Birch Borer are slender, flattened, and have two small spines at the end of the abdomen. They are about 25 mm long.

The adults are a deep olive green to bronze in color. The segment behind the head is a copper color and the head is greenish in males and copper in females. They range from 3/8 to 1/2" in length.

LIFE CYCLE

In N.H., it takes two years for the Bronze Birch Borer to complete development. Adults begin to emerge in late May and early June and can be found emerging until August. After emerging, the adults feed on the leaves for about three weeks. After feeding, they mate and the female deposits her eggs singly or in groups in cracks and crevices in the bark usually on the unshaded areas of the tree. Upon hatching, in two weeks, the larvae bore through the bark and into the wood forming galleries where they will overwinter. It is believed that only fully developed larvae can withstand the winter temperatures and survive the winter. In the following spring, the larvae pupate and the adults emerge.

Larval feeding interferes with sap movement within the tree. If the bark is removed, oblong galleries can be found. Bronze Birch Borers usually attack weakened trees and trees that are vigorous usually ward off any borer attack.

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CONTROL

The best means of control is prevention. Proper maintenance of a birch stand by fertilization, pruning, and watering will keep a birch stand vigorous and is the best line of defense.

If necessary, two foliage applications, seven days apart, of carbaryl (Sevin) may be used mid-May, early June.

A trunk application of *Lindane** seven days after the last carbaryl application is also recommended.

If the use of carbaryl was omitted in June, apply a foliar application of *Lindane** in July.

* Restricted use pesticide in N.H.

SUMMARY

1.	Damaging Stage:	Adult--Foliage Larva--Woodborer
2.	Part of Plant Attacked:	Leaves, Sapwood
3.	Overwintering Stage:	Fully-Developed Larva
4.	Number of Generations Per Year:	One every Two Years
5.	Time of Year When Damage Done:	May, June, July
6.	Number of Applications Per Year:	1-3

SAFE USE OF PESTICIDES

Stop!!! Read the label on every pesticide container each time before using the material. Pesticides must be applied only as directed. Avoid inhaling dusts or sprays. Open windows and ventilate the rooms while using pesticides. Never smoke or eat while spraying or dusting. Remove or cover food, feed, water, kitchen utensils and fish and other pets. Do not allow children near you when applying pesticides. Wash and clean up after using pesticides - change clothes if any pesticide was spilled. Dispose of empty containers safely. Bury 18" deep in an isolated area away from any water supply or place in a trash container. Do not burn aerosol cans. Store pesticides in their original containers in a locked cabinet or shed away from food. Be sure tops or caps are on tight. In case of an accident, follow label directions and call a physician immediately.

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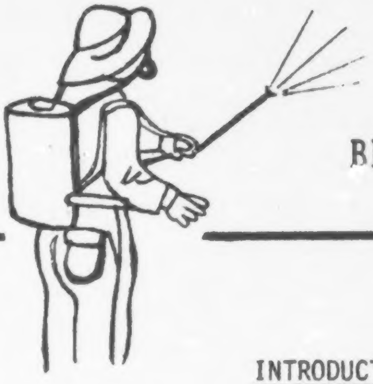
Pest Fact Sheet

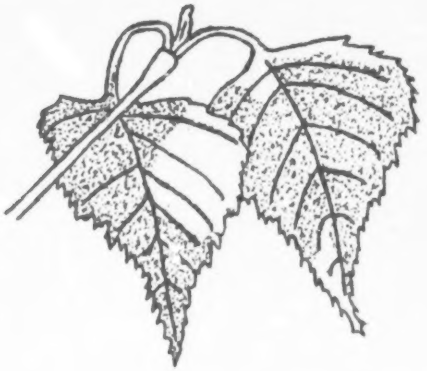
No. 13

PESTICIDE APPLICATOR TRAINING

GREENHOUSE AND NURSERY



BIRCH LEAF MINER



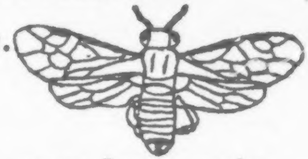
INTRODUCTION

Gray Birch, Paper Birch, and European White Birch are among the favorite host plants of the Birch Leaf Miner, Fenusa pusilla Lepeletier. This European native was introduced into the U.S. pre-1923 and has grown to economic levels as one of the most important nursery insect pests of N.H.

DESCRIPTION OF THE BIRCH LEAF MINER

In it's damaging stage, the larva of the Birch Leaf Miner is a translucent white color, is somewhat flattened, and is 6 mm in length. Several black spots can be found on the underside of the thorax, which is the part of the body where the legs are attached. A black spot is also found on the 1st segment of the abdomen.

The adults are small black wasp-like insects about 1/8" long.



LIFE CYCLE

Buried 1-2" deep, the Birch Leaf Miner overwinters as a full grown larva encircled by a cocoon in the soil. In mid to late May, the larva pupates, and under proper weather conditions, the adults emerge in 8-15 days. After mating, the female, capable of laying several hundred eggs, lays her eggs in the developing birch leaves. In six to ten days, the eggs hatch, (1-20 per leaf) and the young begin to mine between the lower and upper surfaces of the leaf.

This feeding will eventually cause larger blotches in the leaves, a wilting of the leaves, and gradual leaf death. It takes away from the photosynthetic abilities of the tree itself. In most areas, this feeding weakens the tree and causes the birch to be less vigorous and more susceptible to invasion by other insects and diseases. Sometimes the damage from the Birch Leaf Miner can be fatal to the life of the tree.

There are 2 generations of the Birch Leaf Miner per year in N.H.

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CONTROL

The Birch Leaf Miner is controlled by either a single application of granular systemic insecticide in the spring after the buds break, or by two foliar sprays, one in mid-late May and one in early July, to kill the larvae in their mines. Follow label directions for proper application methods and precautionary measures.

Systemic Insecticides: Apply after buds break during April and early May.

1. *disulfoton* (*Di-Syston*)* 15G
2. *aldicarb* (*Temik*)* 15G (For use on commercial field grown and nursery plantings)

Sprays: Apply in mid-late May and early July.

1. carbaryl (Sevin) WP
2. malathion WP or EC
3. dimethoate (Cygon or Daphene) EC
4. *Meta-Systox-R**

* Restricted use pesticide in N.H.

SUMMARY

1. Damaging Stage: Larva
2. Part of Plant Attacked: Birch Leaves
3. Overwintering Stage: Fully Grown Larva in a Cocoon in Soil
4. Number of Generations Per Year: 2
5. Time of Year when Damage Done: May, July
6. Number of Applications Used: 1-2

SAFE USE OF PESTICIDES

Stop!!! Read the label on every pesticide container each time before using the material. Pesticides must be applied only as directed. Avoid inhaling dusts or sprays. Open windows and ventilate the rooms while using pesticides. Never smoke or eat while spraying or dusting. Remove or cover food, feed, water, kitchen utensils and fish and other pets. Do not allow children near you when applying pesticides. Wash and clean up after using pesticides - change clothes if any pesticide was spilled. Dispose of empty containers safely. Bury 18" deep in an isolated area away from any water supply or place in a trash container. Do not burn aerosol cans. Store pesticides in their original containers in a locked cabinet or shed away from food. Be sure tops or caps are on tight. In case of an accident, follow label directions and call a physician immediately.

James S. Bowman
Jon P. Turmel

Extension Entomologists

1/76/1.5M

COOPERATIVE EXTENSION SERVICE

University of New Hampshire

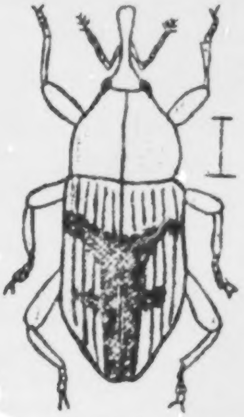
Pest Fact Sheet

No. 14

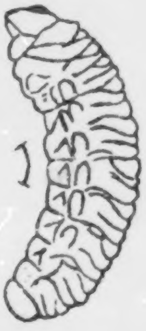
PESTICIDE APPLICATOR TRAINING

GREENHOUSE AND NURSERY

WHITE PINE WEEVIL



adult



larva

INTRODUCTION

The White Pine Weevil is the most destructive insect pest of eastern white pine in North America. Norway spruce, jack pine, Scotch pine, pitch pine, red pine, blue spruce, and white spruce are also susceptible to White Pine Weevil damage. Damage from this weevil results in reduction of lumber yield for lumbermen and poor quality ornamentals for nurserymen.

DESCRIPTION OF THE WHITE PINE WEEVIL

Larvae of the White Pine Weevil are slightly larger than the adult (5-7 mm), are yellowish-white in color, and are legless.

The adult is a snout beetle about 4-6 mm in length. The wing covers (elytra) are marked with brown and white scales with a white patch of these scales at the tip of these wing covers.

The resting stage is a creamy-white pupa and is the same length as the adult (4-6 mm).

LIFE CYCLE

The adult White Pine Weevil overwinters in litter on the ground. From April to May, they emerge and begin to feed on the terminal growth. They favor feeding on the bark 7-10" below the dormant terminal buds.

Eggs are then deposited in the bark of the terminal and hatch in 7-10 days.

The developing larva feeds on the inner bark until maturity in July. Pupation occurs in the larval chambers and the adult then emerges in 10-15 days and continues to feed on old and new growth. The adult feeding does as much damage as the larval feeding.

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CONTROL

At the first sign of wilting and drooping of terminals, check for excessive pitch flow. This usually occurs in late spring. If excessive pitch flow is found, cut open the area of pitch exit and look for the larvae. If found, remove the entire leader and destroy it by burning.

For control of the adult, spray the terminals with *Lindane** in early April, or with *Meta-Systox-R** (0.5%) in late April or early May.

Make sure to check all labels for proper application and rates.

* Restricted use pesticide in N.H.

SUMMARY

1. Damaging Stage:	Adult and Larva
2. Part of Plant Attacked:	Terminal Leader
3. Overwintering Stage:	Adult
4. Number of Generations Per Year:	1
5. Time of Year When Damage Done:	April - May (Adult and Larva)
6. Number of Applications Per Year:	1

SAFE USE OF PESTICIDES

Stop!!! Read the label on every pesticide container each time before using the material. Pesticides must be applied only as directed. Avoid inhaling dusts or sprays. Open windows and ventilate the rooms while using pesticides. Never smoke or eat while spraying or dusting. Remove or cover food, feed, water, kitchen utensils and fish and other pets. Do not allow children near you when applying pesticides. Wash and clean up after using pesticides - change clothes if pesticide was spilled. Dispose of empty containers safely. Bury 18" deep in an isolated area away from any water supply or place in a trash container. Do not burn aerosol cans. Store pesticides in their original containers in a locked cabinet or shed away from food. Be sure tops or caps are on tight. In case of an accident, follow label directions and call a physician immediately.

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1/76/1.5M

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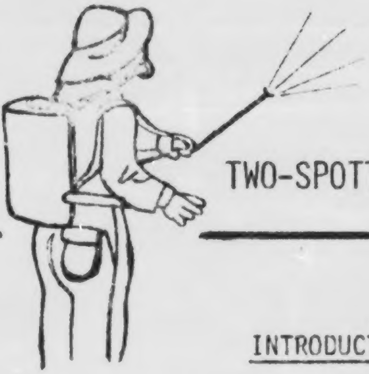
Pest Fact Sheet

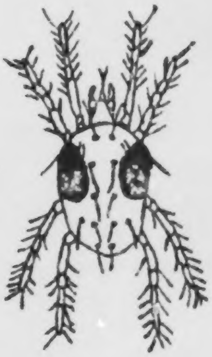
No. 15

PESTICIDE APPLICATOR TRAINING

GREENHOUSE AND NURSERY



TWO-SPOTTED SPIDER MITE



INTRODUCTION

There are several species of spider mites that invade field, garden, greenhouse, nursery, and ornamental plants. The most troublesome of these spider mites is the Two-Spotted Spider Mite, Tetranychus urticae Koch. This mite removes the sap from the leaf tissue, leaving the leaf speckled and when severely infested, the entire plant may die.

DESCRIPTION OF THE TWO-SPOTTED SPIDER MITE

The eggs are spherical, clear to pale green in color, and shiny. They are usually found on the undersides of the leaves where adult feeding activities are present. They are attached to the leaves in the webbing left by the adults.

The first instar is a six-legged stage called a larva and is similar in shape and color to the adult.

The adult is an eight-legged mite, ranging in color from shades of green to brown. The male is smaller than the female, has a narrower, pointed abdomen. Both sexes have sparse spines and two dark pigmented areas on the back. These pigmented areas are food particles which can be seen through the body wall.

LIFE CYCLE

This non-insect pest goes through four stages of development: egg, larva, nymph, and adult.

After being deposited, the egg will hatch in 3-19 days, depending upon temperatures. After hatching, the 6-legged larva will immediately start to feed on the leaves. It will later change into an 8-legged stage, and then to an adult in about 19 days, during which time continual feeding occurs.

There are several continuous generations per year in greenhouses, but this mite can overwinter outdoors as an adult female in N.H.

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CONTROL

NURSERY:

Spray the undersides of leaves on elm, linden, rose, and ornamental fruit trees in late May to mid-June, and again in mid-July to early August. The following materials are recommended:

dicotol (Kelthane
tetradifon (Tedion)
chlorobenzilate WP
*Meta-Systox-R**

GREENHOUSE:

Foliage Spray:

chlorobenzilate WP
demeton (*Systox*)*
diazinon EC
dimethoate (Cygon or De-fend) EC
azinophos-methyl (*Guthion*)*
dicofol (Kelthane) EC or WP
*Meta-Systox-R** SC
Morestan WP
naled (Dibrom) EC
*parathion** 15WP
Pentac WP
*Tepp** EC
tetradifon (Tedion) WP

Granular:

disulfoton (*Di-Syston*)*
aldicarb (*Temik*)*

Aerosol:

sulfotepp (*Dithio*)*

SUMMARY

1. Damaging Stage: All Active Stages
2. Part of Plant Attacked: Leaves
3. Overwintering Stage: All Stages in the Greenhouse In Nursery, Adult Females
4. Number of Generations Per Year: Several Indoors; 8-10 Outdoors
5. Time of Year When Damage Done: Outdoors: Late May-Early June, Late July-Early Aug. Indoors: Year Round
6. Number of Applications Per Year: Variable

SAFE USE OF PESTICIDES

Stop!!! Read the label on every pesticide container each time before using the material. Pesticides must be applied only as directed on the label to be in compliance with the law.

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1/76/1.5M

COOPERATIVE EXTENSION SERVICE

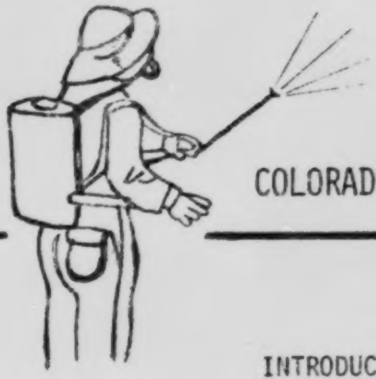
University of New Hampshire

PESTICIDE APPLICATOR TRAINING

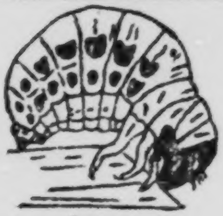
VEGETABLES

Pest Fact Sheet

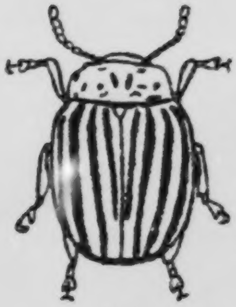
No. 16



COLORADO POTATO BEETLE



larva



adult

INTRODUCTION

The Colorado Potato Beetle became a pest when settlers brought potatoes into the Rocky Mountain area, the native habitat of this beetle. The beetle preferred the potato to it's host weed, and now is a serious pest throughout the U.S. and Eastern Canada.

The Colorado Potato Beetle feeds on the leaves and terminal growth of such plants as potato, tomato, and eggplant. The potato, however, is the preferred plant. The above ground destruction of the plant can cause a reduction in yield and tuber size.

DESCRIPTION OF THE COLORADO POTATO BEETLE

The larva of the Colorado Potato Beetle is about ½" long and is shaped like a semi-circle. They are a shiny reddish-bronze color, having two rows of black spots on either side of the body.

The adult is a distinctive yellow and black striped beetle. The stripes run along the length of the wing covers. The beetles are convex, about 3/8" long and ¼" wide.

The eggs, orange-yellow in color, can be found in groups, usually on the underside of leaves.

LIFE CYCLE

The Colorado Potato Beetle overwinters as an adult in the soil. It emerges early in the spring, mates, and the female lays her eggs (about 500) over a 4-5 week period on the undersides of the host leaves. The eggs are laid in batches of

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approximately 24. Hatching occurs in 4-9 days and the larvae begin to emerge and feed immediately. The larvae go through 4 molting stages in 2-3 weeks. They then enter into the soil, form a spherical cell and pupate. The new adults then emerge in 5-10 days and the life cycle is repeated through a second generation.

CONTROL

All recommended pesticides should be applied in accordance with label instructions:

POTATO:

Foliar Sprays: Repeat as necessary

carbaryl (Sevin)	½-1 lb ai/Acre	0 days to harvest
azinophos-methyl (*Guthion*)*	½-3/4 lb ai/Acre	7 days to harvest
endosulfan (*Thiodan*)*	½ lb ai/Acre	0 days to harvest
methoxychlor	½ lb ai/Acre	0 days to harvest

Systemics: At planting time in seed furrow

aldicarb (*Temik*)*	3.0 lb ai/Acre	90 days to harvest

TOMATO AND EGGPLANT:

Foliar Sprays: Repeat as necessary

carbaryl (Sevin)	1.0 lb ai/Acre	0 days to harvest
*parathion**	½ lb ai/Acre	10--Tomato 15--Eggplant

* Restricted use pesticide in N.H.

SUMMARY

1.	Damaging Stage:	Larva and Adults
2.	Plant Parts Attacked:	Leaves and Terminal Growth
3.	Overwintering Stage:	Adult
4.	Number of Generations Per Year:	Two
5.	Time of Year When Damage Done:	July, August
6.	Number Applications Per Year:	1-3, depending upon the amount of infestation

SAFE USE OF PESTICIDES

Stop!!! Read the label on every pesticide container each time before using the material. Pesticides must be applied only as directed on the label to be in compliance with the law.

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University of New Hampshire

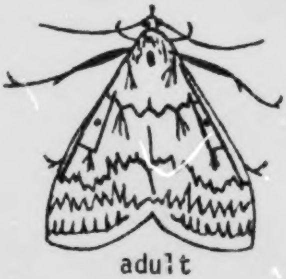
Pest Fact Sheet

No. 17

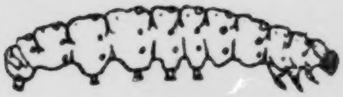
PESTICIDE APPLICATOR TRAINING

VEGETABLES

EUROPEAN CORN BORER



adult



larva

INTRODUCTION

The European Corn Borer was introduced into the U.S. in 1917 and is one of our most destructive pests of corn. Broken tassels, collapsed stalks, feeding signs on leaves, and borings in stalks and ears are evidences of the presence of European Corn Borers. The European Corn Borer occurs in nearly all of the major corn-growing areas in the U.S.

DESCRIPTION OF THE EUROPEAN CORN BORER

The full-grown larva is 3/4-1" long and is flesh-colored with brown spots running the length of the body.

The brown pupa is surrounded by a flimsy cocoon.

The adult moths have a wing span of about an inch. The wings are usually folded tent-like over the body. The males have mosaic markings in bronze, yellow, and beige. The females are slightly larger than the males, have similar markings, and are paler in color.

The eggs can be found on the underside of corn leaves, along the mid-rib. They are laid in groups and look like fish scales. Throughout the season they change color as the egg develops.

LIFE CYCLE

In Southern N.H., there are two generations of the European Corn Borer per year; there is one generation in Northern N.H. It overwinters as a full-grown larva in corn stubble and corn refuse. In the spring, the larva will pupate. Moths will emerge from June to August, with the second generation often occuring in August.

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Each female will lay an average of 500-600 eggs. The eggs hatch into larvae in about a week, and the young larvae begin to feed on the leaves, make small holes, and leave a sawdust-like frass. The larvae migrate into the growing whorl of leaves where they eventually bore into the forming tassel which causes the tassels to break over when mature. As the larvae continue to grow, they eventually bore into the stalks, usually at the internodes, and some find their way to the ears by boring through the side or the stem end of the ear. Heavily infested corn is easily lodged, making picking difficult.

Mature larvae pupate in the cavities and some emerge as adult moths to start the second generation which occurs in August.

CONTROL

First Brood European Corn Borer: Apply up to three applications of any of the following materials on a 5-day schedule beginning at mid-whorl when 25% of the plants show feeding damage on whorl leaves.

carbaryl (Sevin)	1½ lb ai/Acre	0 days to harvest
methomyl (*Lannate*)*	0.45 lb ai/Acre	0 days to harvest

Second Brood European Corn Borer: Apply the above suggested materials when silks begin to form. Direct sprayer to the ear region and repeat at 5,4,3, or 2-day intervals as population pressure increases. This treatment also controls the Corn Earworm.

* Restricted use pesticide in N.H.

SUMMARY

1. Damaging Stage: Larva
2. Part of Plant Attacked: Leaves, Stalk, Tassel, Ear
3. Overwintering Stage: Larva
4. Number of Generations Per Year: 2 (Southern N.H.)
5. Time of Year When Damage Done: July, August
6. Number of Applications Used: 1st Brood: up to 3
   2nd Brood: up to 3

SAFE USE OF PESTICIDES

Stop!!! Read the label on every pesticide container each time before using the material. Pesticides must be applied only as directed on the label to be in compliance with the law.

James S. Bowman
Jon P. Turmel

1/76/1.5M

COOPERATIVE EXTENSION SERVICE

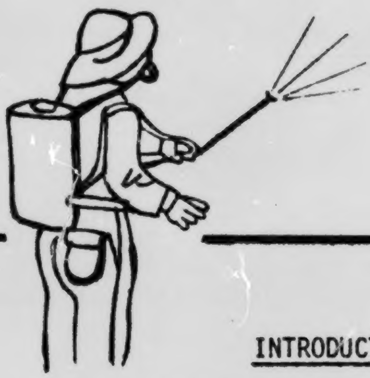
University of New Hampshire

Pest Fact Sheet

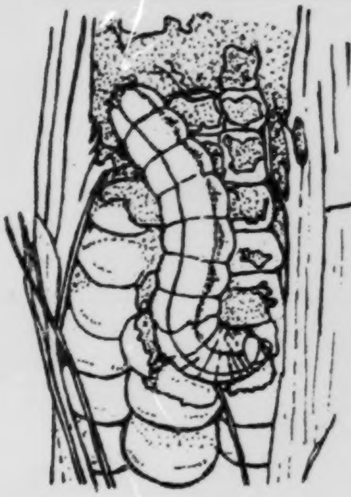
No. 18

PESTICIDE APPLICATOR TRAINING

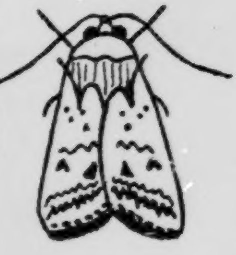
VEGETABLES



CORN EARWORM



larva



adult

INTRODUCTION

The Corn Earworm, Heliothis zea, is considered one of the worst pests of sweet corn. It might go undetected until harvest time when it is often first discovered by the customer. They have a world-wide distribution and are a major problem in the south. The Corn Earworm is not only a pest of corn, but also of tomato and cotton, where it is known as the Tomato Fruitworm and the Cotton Bollworm.

DESCRIPTION OF THE CORN EARWORM

The Corn Earworm larvae vary in color; some individuals are green, some are pinkish-brown, and some are nearly black. It is a large larva, about 2" long when full-grown, and it has alternating light and dark stripes which run the length of the body. When viewed closely, the body has tufts of short bristles. The head capsule is an orange-yellow color and the legs are black.

The adult moth varies in color from creamy-yellow to an olive brown. There are irregular lines and spots on the moth; one of the spots characteristically shows through to the underside of the wing.

The eggs, which are laid singly on the silks, are shaped like a semi-sphere and have ridges along their sides.

LIFE CYCLE

The Corn Earworm overwinters in southern U.S. as a pupa. It is not known to overwinter in New Hampshire. The adult emerges in the spring and flies north in the summer, typically arriving in N.H. about the first of August. The female lays her

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eggs singly, preferably on fresh corn silk. A single female will lay 500-3,000 eggs. The eggs hatch in 2-10 days, and the larva will begin to feed on the silk. They stop feeding on the silk when it becomes dry, and will then move to the tip of the ear where the larva feeds on the kernels for 2-4 weeks. After a 5th molt the larva drops to the ground to pupate and later emerge as an adult. Late corn is the most vulnerable since it can be attacked by both local and migrating moths.

CONTROL

Corn Earworm control is not necessary on plantings or varieties maturing by mid to late July in New Hampshire. Begin applications of insecticides when moths arrive and when 25% of the ears show silk. Repeat at 3-4 day intervals in light infestations. The following materials are suggested:

carbaryl (Sevin)	1.5 lb/A
*methomyl (Lannate)**	0.45 lb/A

Both of these materials have a 0 days-to-harvest and reentry period.

* Restricted use pesticide in N.H.

SUMMARY

1.	Damaging Stage:	Larva
2.	Plant Part Attacked:	Ear
3.	Overwintering Stage:	Does Not Overwinter in N.H.
4.	Number of Generations Per Year:	1 and a Partial 2nd
5.	Time of Year When Damage Done:	August, September, and October
6.	Number of Applications Per Year:	4-6

SAFE USE OF PESTICIDES

Stop!!! Read the label on every pesticide container each time before using the material. Pesticides must be applied only as directed on the label to be in compliance with the law. Avoid inhaling dusts or sprays. Open windows and ventilate the rooms while using pesticides. Never smoke or eat while spraying or dusting. Remove or cover food, feed, water, kitchen utensils and fish and other pets. Do not allow children near you when applying pesticides. Wash and clean up after using pesticides - change clothes if any pesticide was spilled. Dispose of empty containers safely. Bury 18" deep in an isolated area away from any water supply or place in a trash container. Do not burn aerosol cans. Store pesticides in their original containers in a locked cabinet or shed away from food. Be sure tops or caps are on tight. In case of an accident, follow label directions and call a physician immediately.

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1/76/1.5M

COOPERATIVE EXTENSION SERVICE

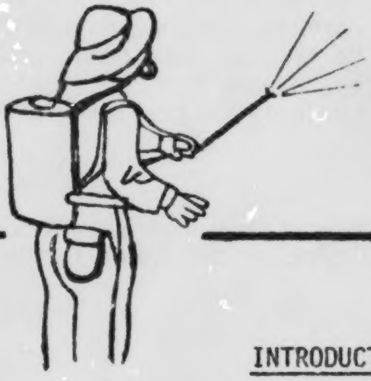
University of New Hampshire

Pest Fact Sheet

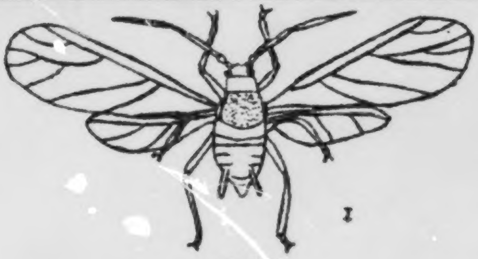
No. 19

PESTICIDE APPLICATOR TRAINING

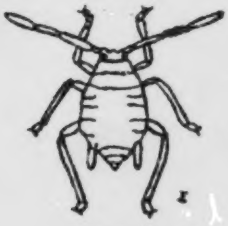
VEGETABLES



APHIDS



adult



nymph

INTRODUCTION

Aphids or Plant Lice, are found on most vegetable crops grown in N.H. With their great ability to reproduce, aphids can build up in large numbers in a very short period of time. They are of economic importance in three ways: 1) They remove sap from their host and inject a toxin causing the plant to wilt, yellow, and often die; 2) Some aphids transmit viruses that cause plant diseases; 3) They excrete a sticky substance called honeydew upon which a black sooty mold can grow and decrease the value of the crop.

DESCRIPTION OF APHIDS

There are several species of aphids in N.H. They are usually green in color but some range from brown and black to yellow and pink. Aphids are soft-bodied, about 1/16 to 1/8" in length. They have piercing-sucking mouthparts that are used to pierce plant tissue and remove the sap. Aphids can be easily distinguished by the two tube-like appendages (cornicles) that can be found on the posterior end of the abdomen. Adults can be winged or wingless. When wings are present, they are transparent and in two pairs.

Eggs are tiny, oval, black, and found attached to undersides of leaves, stems, and in crevices of most host plants.

LIFE CYCLE

Most aphids overwinter as eggs on perennial plants or in plant debris. Some will overwinter as adult females. In the spring, the nymphs emerge from the eggs and develop to adults quickly. These adults are wingless females called "stem-mothers" and have the ability to give birth to living young without mating. Within a two-

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week period, one female can produce 50-100 active nymphs. Some of these females will then develop wings and fly to an alternate host called the summer host. These winged females are called "spring migrants." A new generation is started on a new host. As the cold weather approaches, both males and females develop wings and return to the perennial plants. The females once again produce live nymphs but these female nymphs, once reaching maturity, cannot reproduce unless mating occurs. Once mating occurs, the female deposits her eggs in the overwintering sites.

CONTROL

The following insecticides are examples of Aphicides registered on various crops. Consult your County Agent or the label for recommendations on specific crop species.

demeton (_Systox_)* EC
_parathion_* EC
dimethoate (Cygon)
diazinon EC
mevinphos (_Phosdrin_)*
endosulfan (_Thiodan_)* EC or WP
_Tepp_*
_Meta-Systox-R_* EC

malathion EC
methomyl (_Lannate_)* SP-L
Monitor 4
phorate (_Thimet_)*
_Di-Syston_* G
_Temik_* 15G
pyrethrins

When applying an aphid spray, make sure to follow the directions on the label, and use only registered materials on your specific crop.

* Restricted use pesticide in N.H.

SUMMARY

1. Damaging Stage: Nymph and Adult
2. Plant Parts Attacked: Leaf and Stem Tissue, Flower Parts
3. Overwintering Stage: Outdoors in N.H. as Eggs; Some Adults
4. Number of Generations Per Year: Variable
5. Time of Year When Damage Done: Entire Growing Season
6. Number of Applications Per Year: Variable; Depends Upon Infestation and Crop

SAFE USE OF PESTICIDES

Stop!!! Read the label on every pesticide container each time before using the material. Pesticides must be applied only as directed on the label to be in compliance with the law. Avoid inhaling dusts or sprays. Open windows and ventilate the rooms while using pesticides. Never smoke or eat while spraying or dusting. Remove or cover food, feed, water, kitchen utensils and fish and other pets. Do not allow children near you when applying pesticides. Wash and clean up after using pesticides - change clothes if any pesticide was spilled. Dispose of empty containers safely. Bury 18" deep in an isolated area away from any water supply or place in a trash container. Do not burn aerosol cans. Store pesticides in their original containers in a locked cabinet or shed away from food. Be sure tops or caps are on tight. In case of an accident, follow label directions and call a physician immediately.

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1/76/1.5M

COOPERATIVE EXTENSION SERVICE

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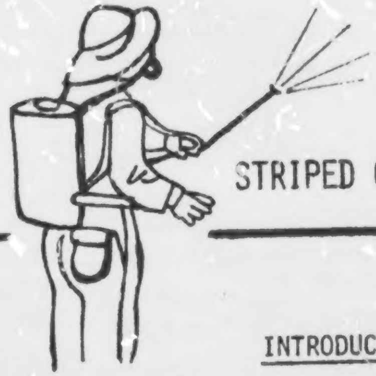
Pest Fact Sheet

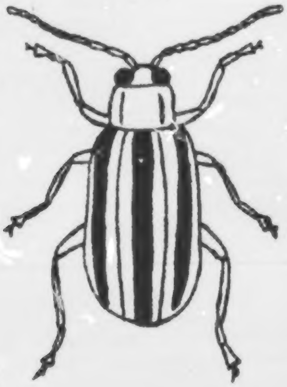
No. 20

PESTICIDE APPLICATOR TRAINING

VEGETABLES



STRIPED CUCUMBER BEETLE



INTRODUCTION

The Striped Cucumber Beetle, Acalymma vittata (Fab.), is one of the most devastating pests of cucurbits (squash, cucumber, melon) in the U.S. east of the Rocky Mountains. Both the adult and larva feed on cucurbits. This insect is also responsible for the spread of diseases such as bacterial wilt and cucumber mosaic.

DESCRIPTION OF THE STRIPED CUCUMBER BEETLE

The adult beetle is ¼" long, is a yellow-green color, and has three black longitudinal stripes on the wing cover.

Eggs are small and orange-to-yellow in color.

The worm-like larva is slender, white, and about 1/3" long when full-grown.

LIFE CYCLE

The Striped Cucumber Beetle overwinters as an unmated adult in the neighboring areas of old cucurbit patches. They overwinter under fallen leaves, in hedgerows, near their wild food sources (goldenrod, aster), and in trash. The adults emerge in early spring before cucurbits are available as food, so they feed on pollen, petals, and leaves of alternate hosts. Once the cucurbits begin to emerge, or hot caps are removed, the adult beetles migrate to their preferred host. Mating occurs at this time and eggs are deposited at the base of the host, below the surface of the ground. Upon hatching (8-10 days), the larva will migrate to the root system and feed upon the roots for a period of 2-6 weeks during which time the entire root system may be consumed. Pupation occurs in the soil and the adult emerges in one week. After feeding on the cucurbits, the adults return to the outlying areas for the winter.

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CONTROL

Early control measures must be used in order to kill the adult and prevent the spread of wilt disease. Apply the following materials when beetles are first seen. Keep an eye open for chewing damage as the plant emerges. Be sure to follow the label for specific use instructions on various crops.

carbaryl (Sevin)	1 lb/A
endosulfan (*Thiodan*)*	½ lb/A
methoxychlor	1-1½ lb/A
malathion	½ lb/A
*parathion**	2 lb/A

Do not use insecticides during bloom They present a hazard to bees.

Do not apply *parathion** when plants are wet; it may injure the plants, especially if the plant is young.

* Restricted use pesticide in N.H.

SUMMARY

1.	Damaging Stage:	Larva, Adult
2.	Plant Parts Attacked:	Roots, Leaves, and Fruit
3.	Overwintering Stage:	Adult
4.	Number of Generations Per Year:	1
5.	Time of Year When Damage Done:	May-September
6.	Number of Applications Used:	2-3

SAFE USE OF PESTICIDES

Stop!!! Read the label on every pesticide container each time before using the material. Pesticides must be applied only as directed on the label to be in compliance with the law. Avoid inhaling dusts or sprays. Open windows and ventilate rooms while using pesticides. Never smoke or eat while spraying or dusting. Remove or cover food, feed, water, kitchen utensils and fish and other pets. Do not allow children near you when applying pesticides. Wash and clean up after using pesticides - change clothes if any pesticide was spilled. Dispose of empty containers safely. Bury 18" deep in an isolated area away from any water supply or place in a trash container. Do not burn aerosol cans. Store pesticides in their original containers in a locked cabinet or shed away from food. Be sure tops or caps are on tight. In case of an accident, follow label directions and call a physician immediately.

James S. Bowman
Jon P. Turmel

Extension Entomologists

1/76/1.5M

COOPERATIVE EXTENSION SERVICE

University of New Hampshire

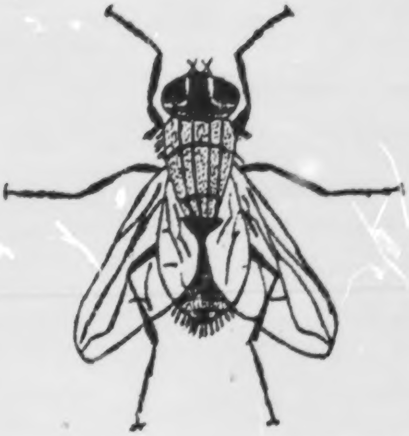
Pest Fact Sheet

No. 21

PESTICIDE APPLICATOR TRAINING

LIVESTOCK AND POULTRY

HOUSE FLY



INTRODUCTION

The House Fly, Musca domestica, is probably the best known insect pest. They are of economic importance because they transmit disease-causing organisms and are a nuisance to everyone they come in contact with. House Fly control is a necessity in and around farms and homes.

DESCRIPTION OF THE HOUSE FLY

The adult is usually 4-7 mm in length with the male being smaller than the female. The thorax has four narrow stripes and one pair of wings. Both sexes have sponging mouthparts.

The immature stage is called a maggot. The maggot is creamy white, legless, 7-10 mm in length, tapers off at one end, and has no distinct head capsule.

The pupa ranges from yellowish-red to black in color. The size is from 4-7 mm and has the shape of a seed.

LIFE CYCLE

In N.H., the House Fly overwinters outdoors as larvae or pupae in such habitats as manure piles and organic matter. Some adults will also survive the winter in heated buildings where breeding continues slowly throughout the winter.

Each female lays from 75-150 eggs per cluster and in her lifetime will deposit from 350-900 eggs. She will deposit these eggs 4-12 days after emerging from the pupal case. The eggs are deposited in moist materials; fresh manure (less than 1 day old) is the preferred area. The maggot will emerge in 8-20 hours and begin feeding. Under favorable conditions, the larva will go through its three stages of

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development in 3-7 days. Before pupating, the larva will migrate to a cool dry area, usually the soil beneath the manure pile. Depending on the temperature and humidity, the adult will emerge from the pupal case in 3 days to 4 weeks. There are 10-12 generations per year.

CONTROL

One of the most important practices for fly control is sanitation. Removal of manure, prevention of buildup, screening of the area, and hauling of the manure are all good practices to employ.

When necessary, the following insecticides can be used:

DAIRY; BEEF CATTLE; SHEEP; GOATS, SWINE:

1. Residual Wall Sprays:

   dimethoate (Cygon) EC or
   ronnel (Korlan) EC or
   Rabon WP or EC or
   fenthion (*Baytex*)* EC

2. Manure Treatment:

   Rabon WP or EC or
   dimethoate (Cygon) EC

3. Stock and Space Sprays:

   crotoxyphos (Ciodrin) +
   dichlorvos (Vapona)
   (also used as back rubber) or
   Pyrethrins + Synergist or
   dichlorvos (*Vapona*)* or
   ~~naled (Dibrom)~~

4. Milk Rooms:

   pyrethrum aerosol
   Vapona Pest Strips

POULTRY HOUSES:

1. Residual Wall Spray
   (Birds in House):

   tetrachlorvinphos (Rabon) WP or EC
   ronnel (Korlan) EC
   (Birds not in House):

   tetrachlorvinphos (Rabon) EC or
   dimethoate (Cygon) EC

2. Manure Treatment under Caged Birds:

   dimethoate (Cygon) EC or
   ronnel (Korlan) EC or
   Rabon EC

*Restricted Use Pesticide in N.H.

SUMMARY

1. Damaging Stage:	Adult
2. Area Infested:	Buildings, Barnyard, and Pastures Associated With Livestock and Poultry
3. Overwintering Stage:	Larva, Pupa, and Adult
4. Number of Generations Per Year:	10-12
5. Time of Year When Damage Done:	Summer Months
6. Number of Applications Used:	Variable

SAFE USE OF PESTICIDES

Stop!!! Read the label on every pesticide container each time before using the material. Pesticides must be applied only as directed on the label to be in compliance with the law.

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Jon P. Turmel

1/76/1.5M

Extension Entomologists

COOPERATIVE EXTENSION SERVICE

University of New Hampshire

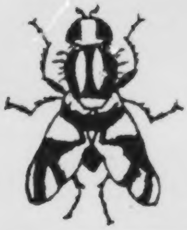
Pest Fact Sheet

No. 22

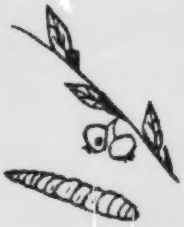
PESTICIDE APPLICATOR TRAINING

SMALL FRUIT

BLUEBERRY MAGGOT



adult



larva

INTRODUCTION

The Blueberry Maggot, *Rhagoletis mendax*, is one of the most destructive insect pests of blueberry in N.H. This close relative of the Apple Maggot, *Rhagoletis pomonella*, differs slightly in form and size and for many years they both were considered the Apple Maggot. Today, it causes damage to fruit throughout the blueberry regions of the Atlantic States.

DESCRIPTION OF THE BLUEBERRY MAGGOT

The adult is smaller than the Apple Maggot with black zigzag bands found on the wings.

The immature stage is a white, legless maggot and can be found in the ripened berries.

Pupae are found 1-2" deep in the soil around the blueberry area.

Eggs are laid singly beneath the skin of ripened fruit.

LIFE CYCLE

The life cycle of the Blueberry Maggot is almost identical to that of the Apple Maggot. The Blueberry Maggot overwinters as a pupa 1-2" below the surface of the soil. In mid-July, as the berries ripen, the adult emerges and within a week's time will feed and mate. The eggs are deposited singly beneath the surface of a ripening berry. Feeding occurs for a 2-week period during which time the larva molts twice. When full grown, the larva drops to the ground, if the berry hasn't already fallen, and enters the soil and pupates where it will remain for the winter.

NOTE OF COMPARISON: Besides morphological differences in size and structures, the Blueberry Maggot differs from the Apple Maggot in two ways. 1) During egg laying, the female of the Blueberry Maggot deposits only one egg per fruit, whereas the

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Apple Maggot will deposit more than one egg per fruit. 2) During egg laying, the female Blueberry Maggot is much more active and is seldom observed depositing her egg in the berry. The Apple Maggot is sluggish and easily observed.

CONTROL

malathion	4%D	25 lbs/acre	1 day to harvest
	20%WP	2 lbs/acre	
carbaryl (Sevin)	50%WP	2 lbs/100 gal	
	5%D	20 lbs/acre	
*Guthion**	50%WP	1-1½ lbs/ 100 gal	14 days to harvest
	22%SC	2-3 pts/acre	" "
	3%D	20 lbs/acre	" "

* Restricted use pesticide in N.H.

SUMMARY

1.	Damaging Stage:	Maggot (Larva)
2.	Part of Plant Attacked:	Ripened Fruit
3.	Overwintering Stage:	Pupa in Soil
4.	Number of Generations Per Year:	One
5.	Time of Year When Damage Done:	July, August
6.	Number of Applications Used:	3-4

SAFE USE OF PESTICIDES

Stop!!! Read the label on every pesticide container each time before using the material. Pesticides must be applied only as directed on the label to be in compliance with the law. Avoid inhaling dusts or sprays. Open windows and ventilate the rooms while using pesticides. Never smoke or eat while spraying or dusting. Remove or cover food, feed, water, kitchen utensils and fish and other pets. Do not allow children near you when applying pesticides. Wash and clean up after using pesticides - change clothes if any pesticide was spilled. Dispose of empty containers safely. Bury 18" deep in an isolated area away from any water supply or place in a trash container. Do not burn aerosol cans. Store pesticides in their original containers in a locked cabinet or shed away from food. Be sure tops or caps are on tight. In case of an accident, follow label directions and call a physician immediately.

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Extension Entomologists

1/76/1.5M

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University of New Hampshire

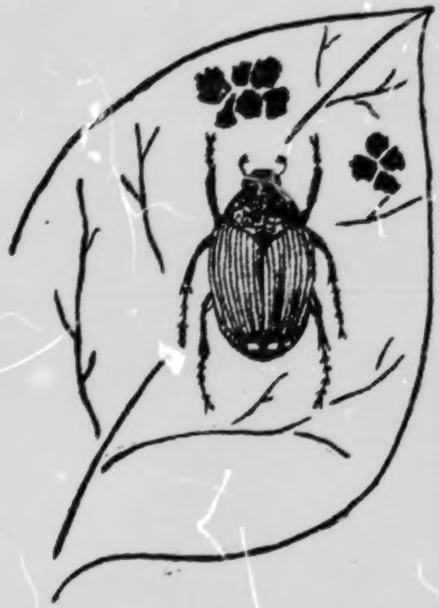
Pest Fact Sheet

No. 23

PESTICIDE APPLICATOR TRAINING

SMALL FRUITS
ORNAMENTALS AND TURF

JAPANESE BEETLE



INTRODUCTION

The Japanese Beetle, Popillia japonica. was first introduced into this country on the roots of nursery stock from Japan to New Jersey in 1916. Today, it can be found in all states east of the Mississippi River.

DESCRIPTION OF THE JAPANESE BEETLE

The adult Japanese Beetle is 12 mm in length and is broadly oval. The entire body is a metallic greenish-bronze with dark green legs and coppery-brown wing covers. Two small tufts of white are found behind the wing covers on the abdomen and five smaller patches on the side of the abdomen. All white patches can be seen when the adult is at rest because the wing covers are shorter than the abdomen.

The immature stage is the larva. It is a C-shaped white grub with an orange-yellow head capsule. When fully grown, it is 25 mm in length.

LIFE CYCLE

The Japanese Beetle overwinters in N.H. as a larva in the soil. In early spring pupation occurs and the adults emerge in early June. Peak emergence occurs in July. The adults feed on nearby fruit and foliage. After mating, eggs are deposited in the soil 2-6" deep. Upon hatching, the grub will feed on decaying vegetation only to later feed on roots of grasses and other plants as development continues. There is only one generation per year in N.H.

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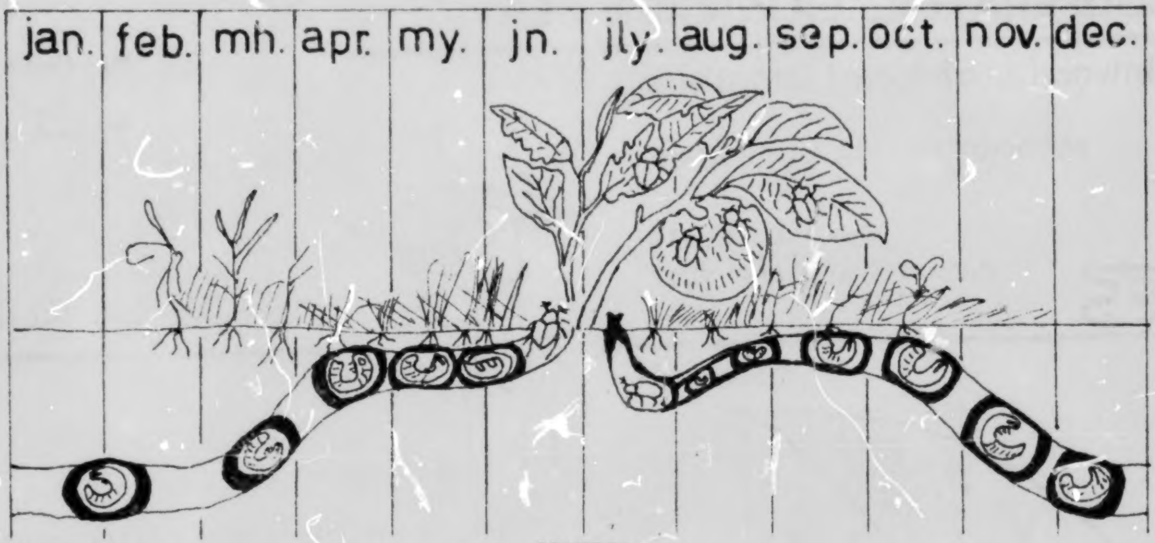

CONTROL

Grapes: Adult beetle control; apply when beetles appear in numbers.

carbaryl (Sevin)	2 lbs/100
methoxychlor	2 lbs/100

Ornamentals: Adult beetle control; apply according to label directions when beetles appear in numbers.

carbaryl (Sevin); methoxychlor; diazinon

Turf: Grub control

diazinon or Dursban

Milky Spore Disease; Note: do not use on areas treated with insecticides. Grubs must be present to spread and maintain disease.

SUMMARY

1. Damaging Stage and Plant Parts Attacked: Adult: foliage -- Immature: turf roots
2. Overwintering Stage: Larva
3. Number of Generations Per Year: One
4. Time of Year When Damage Done: Grapes and Ornamentals: June-July; Turf: July, August, September
5. Number of Applications Per Year: 1-2

SAFE USE OF PESTICIDES

Stop!!! Read the label on every pesticide container each time before using the material. Pesticides must be applied only as directed on the label to be in compliance with the law.

James S. Bowman
Jon P. Turmel

2/76/1.5M

Extension Entomologists

COOPERATIVE EXTENSION SERVICE

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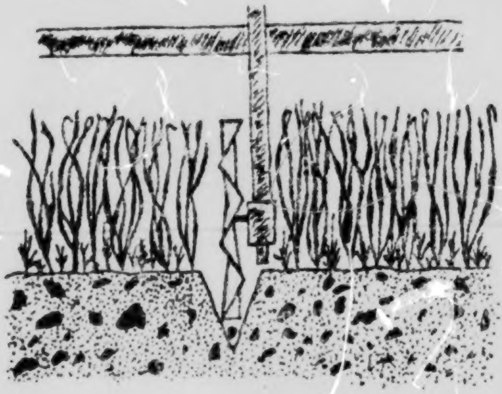
PESTICIDE APPLICATOR TRAINING

FORAGE CROPS

Pest Fact Sheet

No. 24

WEEDS IN NO-TILLAGE CORN



INTRODUCTION

The no-tillage system involves direct placement of seed without prior seed-bed preparation or subsequent cultivation. Herbicide utilization is the key to this system. Herbicides are needed to a) suppress all vegetation at and immediately following planting, and b) prevent or discourage the invasion of annual weeds during the growing season. The herbicide materials used in this no-tillage system are all applied in a single application.

DESCRIPTION OF THE GRASS SOD

Although no-tillage plantings are sometimes made in run-out alfalfa or clover-grass sods, the more common practice to to plant in old grass sod. In this state, the common grass sods would include such perennial grasses as quackgrass, smooth bromegrass, the bluegrasses, red top, and reed canarygrass. These grasses are characterized by their underground rhizomes and their general tendancy to spread. Another group of perennial grasses would include the grasses that tend to have a bunched type of growth such as orchardgrass, red fescue, or perennial ryegrass. All of the grasses listed above are tall growing species (30-45") with the exception of bluegrass and red fescue which tend to grow to 18-24" under normal conditions.

CONTROL

ANNUAL WINTER RYE COVER CROP: Treat with a broadcast application before the rye reaches 24" growth. Additional growth may make it more difficult to achieve proper seed placement and uniform spray coverage. The following herbicides are suggested for no-tillage corn plantings in a rye cover crop.

*paraquat CL**	1 pint in 30 gallons per acre and
Atrazine 80W	1¼ pounds plus
Lasso 4EC	2½ quarts or
Princep 80W	2½ pounds

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Use a surfactant such as Spreader X-77 or CHARGER at the rate of 8 ounces per 100 gallons of spray solution. Add *paraquat**, then surfactant after the other materials are thoroughly mixed into solution.

ESTABLISHED GRASS SOD: Despite the rapid uptake of water and nutrients from early spring growth, the application of *paraquat** should not be made to established sod until just prior to planting. An application of *paraquat** will provide some suppression of a perennial grass sod for approximately 4 weeks. *Paraquat** applied a week or two prior to planting will provide only two or three weeks of sod suppression following planting. Two herbicide treatments are offered as follows:

1.	*paraquat CL**	1 quart in 30 gallons per acre and
	Atrazine 80W	2½ pounds
	(Add surfactant and combine in the order suggested above.)	
2.	Atrazine 80W	5 pounds
	(This treatment should be applied at least two weeks prior to planting corn.)	

NOTE: Care must be taken when using *paraquat**as this is a hazardous material. Read the label and use strictly in accordance with the directions. *Paraquat** is a contact herbicide which destroys all green plant tissue. Do not apply under conditions where drift will occur and the *paraquat** might accidentally reach non-target food, forage, or other plants, thus rendering them unfit for sale or consumption.

* Restricted use pesticide in N.H.

SUMMARY

1.	Purpose of Control Treatment:	Reduce Competition from Grass Sod
2.	Length of Control or Suppression:	3-4 Weeks
3.	Date of Application:	Use *paraquat** at Planting Time; Use Other Materials Two Weeks Prior to Planting
4.	Number of Applications:	1 to Established Weeds

SAFE USE OF PESTICIDES

Stop!!! Read the label on every pesticide container each time before using the material. Pesticides must be applied only as directed on the label to be in compliance with the law.

James R. Mitchell
Extension Agronomist

1/76/1.5M

COOPERATIVE EXTENSION SERVICE

University of New Hampshire

Pest Fact Sheet

No. 25

PESTICIDE APPLICATOR TRAINING

VEGETABLES AND POTATOES

CONTROL OF WEEDS IN VEGETABLES AND POTATOES

INTRODUCTION

This Fact Sheet provides information on the weed killer (herbicide) *dinoseb**, having the trade names of *Premerge**, *Basanite**, *Sinox PE**, *Dinitro**, and sometimes referred to as *DNBP**. *Dinoseb** is used as a pre-emergence and early post-emergence herbicide for most broadleaf annual weeds and a few annual grasses.

DESCRIPTION

*Dinoseb** will control most broadleaf annual weeds such as lambsquarters, pigweed, mustard, purslane, and ragweed in certain vegetables and potatoes. With higher rates of application, some annual grasses such as crabgrass and foxtails can be controlled. *Dinoseb** will not control nutsedge and quackgrass. Drought or cool weather conditions decreases the effectiveness of this herbicide.

CONTROL

VEGETABLE	RATE PER ACRE	WHEN TO APPLY	COMMENTS
Beans: Snap, Dry, or Lima (At Planting)	1½ - 2 gal	At planting time	Use lower rate on sandy soil.
(At Emergence)	1 gal	When not more than 4-5% of crooks are showing, at emergence.	Apply when soil is cracking. Restrict to sandy loams and heavier soils.

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VEGETABLE	RATE PER ACRE	WHEN TO APPLY	COMMENTS
Cucumbers (Seeded)	3-4 quarts	Immediately after planting	Sow seed at depth of one inch. Damage can occur on sandy soils with low organic matter. Use lower rate on sandy soil. Do not use if soil is to be covered with plant protectors.
Peas	1½ gal	Pre-emergence	Apply when soil is cracking or when 4-5% of plants have barely emerged. Restrict use to sandy loam or heavier soils. Use higher rate if annual grasses are a serious problem.
Pumpkin, Squash	3-4 quarts	Immediately after planting	Plant seed at least 3/4" deep in clay soils and 1" deep in sandy soils. Injury may result in sandy soils low in organic matter. Do not use if soil is to be covered with plant protectors.
Sweet Corn	1-2 gal	At planting (2 gal/A) Before emergence (1-1½ gal/A)	Use lower rates on sandy soils and when grassy weeds are not a problem.
Potatoes	2-6 quarts	Pre-emergence to potatoes	If possible, delay until 1-3 days before potatoes emerge. Use lower rates for broadleaf weeds only and higher rates if annual grasses are a problem. Apply before weeds are ½" high.

NOTE: Do not allow spray drift to contact other desirable crops or plants. *Dinoseb** is toxic to fish and wildlife. Apply as per label. *Dinoseb** will stain clothing.

* Restricted use pesticide in N.H.

SUMMARY

1. Purpose of Control Treatment: To Control Annual Broadleaf and Grassy Weeds
2. Length of Control or Suppression: Seasonal, But Only 3-4 Weeks of Residual
3. Date of Application: Pre-Emergence to Crop
4. Number of Applications: One

SAFE USE OF PESTICIDES

Stop!!! Read the label on every pesticide container each time before using the material. Pesticides must be applied only as directed on the label to be in compliance with the law.

2/76/1.5M

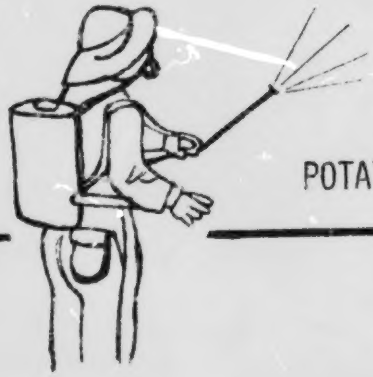
Otho S. Wells
Extension Vegetable Specialist

COOPERATIVE EXTENSION SERVICE
University of New Hampshire

Pest Fact Sheet
No. 26

PESTICIDE APPLICATOR TRAINING

POTATOES



POTATO VINE KILLING

INTRODUCTION

In order to facilitate harvesting and to improve potato quality, potato vines are killed prior to harvest. This can be done either mechanically or with a desiccant. The most efficient system is to combine these methods by rolling or bending the tops prior to herbicide application.

CONTROL

The herbicide *dinoseb** (*dinitro**, *Dow General**, *Premerge**, *or Sinox PE**) is used for pre-harvest potato vine killing.

Split applications are used at ½ rate with the second application following the first by 5-7 days. Spray 10-20 days before harvest in warm, sunny weather.

*Dow General**:	2-3 quarts in 5 gallons of diesel or fuel oil in 25-40 gallons of water per acre. Use the higher rate in cool, cloudy weather or in dense foliage.
Premerge or Sinox**:	2-3 quarts in 5 gallons water. A non-ionic emulsifier (such as Triton X-100, Tween 85, etc.) must be used as follows: mix 1 pint of emulsifier in 5 gallons of fuel oil and add this to 30 gallons of water in spray tank and agitate. Then add the *Premerge** *or Sinox PE** and vigorously agitate.

NOTE: *Dinoseb** is toxic to fish and wildlife. Apply as per label. *Dinoseb** will stain clothing.

* Restricted use pesticide in N.H.

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SUMMARY

1. Purpose of Control Treatment: To Kill Potato Vines
2. Length of Control: Total Kill
3. Date of Application: 10-20 Days Prior To Harvest
4. Number of Applications: Not to Exceed 2

SAFE USE OF PESTICIDES

Stop!!! Read the label on every pesticide container each time before using the material. Pesticides must be applied only as directed on the label to be in compliance with the law. Avoid inhaling dusts or sprays. Open windows and ventilate the rooms while using pesticides. Never smoke or eat while spraying or dusting. Remove or cover food, feed, water, kitchen utensils and fish and other pets. Do not allow children near you when applying pesticides. Wash and clean up after using pesticides - change clothes if any pesticide was spilled. Dispose of empty containers safely. Bury 18" deep in an isolated area away from any water supply or place in a trash container. Do not burn aerosol cans. Store pesticides in their original containers in a locked cabinet or shed away from food. Be sure tops or caps are on tight. In case of an accident, follow label directions and call a physician immediately.

Otho S. Wells
Extension Vegetable
Specialist

1/76/1.5M

COOPERATIVE EXTENSION SERVICE

University of New Hampshire

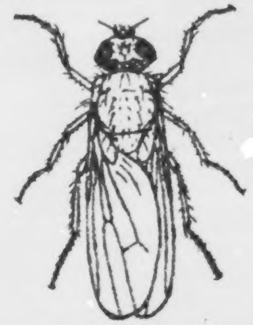
Pest Fact Sheet

No. 27

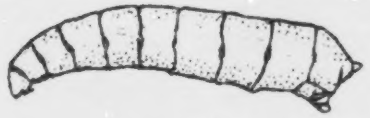
PESTICIDE APPLICATOR TRAINING

VEGETABLES

SEED CORN MAGGOT



adult



maggot

INTRODUCTION

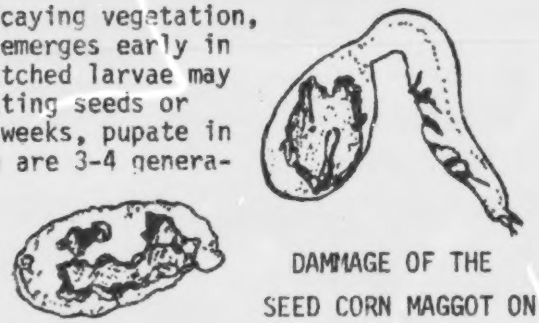
The Seed Corn Maggot, Hylemya platura (Meigen), was probably introduced from Europe in the mid-1800's and is widely distributed in the U.S. and Canada. The white maggot will attack the sprouting seed of corn and a variety of vegetables including beans, peas, cabbage, turnip, onion, radish, spinach, and sprouting potatoes. This weakens the plants and causes poor stands.

DESCRIPTION OF THE SEED CORN MAGGOT

The adult fly is small (1/5" long), grayish-brown, and resembles the housefly nd adults of other root-infesting maggots. The eggs are laid in moist soil where here is an abundance of decaying vegetation. A fully grown maggot is yellowish-hite in color, legless, and pointed at the head end. The pupal stage is spent inside brown puparia in the soil.

LIFE CYCLE

The winter is spent as a larva in manure or decaying vegetation, r inside the capsule-like puparia. The adult fly emerges early in ay and begins its egg-laying activities. Newly hatched larvae may eed as scavangers, but eventually find the germinating seeds or oots of plants. They complete development in 2-3 weeks, pupate in he soil, and emerge as adults in 1-2 weeks. There are 3-4 generaions per year depending upon weather conditions.



DAMMAGE OF THE SEED CORN MAGGOT ON BEAN

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CONTROL

Cultural Practices: Preparing the land early in the season, not planting too deep, and not spreading manure in the spring are all helpful practices in reducing Seed Corn Maggot problems.

Seed Treatment: The best insurance against Seed Corn Maggot is by treating the seed with insecticides and fungicides. Never use insecticides alone since the fungicide is needed to safen the treated seed against disease organisms.

Planter Box Treatment: Materials needed to treat 100 lbs. seed.

diazinon WP	1 oz actual plus captan or thiran
*Lindane** WP	0.25 oz actual plus captan or thiran

Slurry Seed Treatment:

Lorsban	1 oz actual plus captan or thiran

* Restricted use pesticide in N.H.

SUMMARY

1. Damaging Stage:	Maggot (Larva)
2. Part of Plant Attacked:	Seed and Roots
3. Overwintering Stage:	Larva or Puparia
4. Number of Generations Per Year:	3-4
5. Time of Year When Damage Done:	May-June
6. Number of Applications Used:	One

SAFE USE OF PESTICIDES

Stop!!! Read the label on every pesticide container each time before using the material. Pesticides must be applied only as directed on the label to be in compliance with the law. Avoid inhaling dusts or sprays. Open windows and ventilate the rooms while using pesticides. Never smoke or eat while spraying or dusting. Remove or cover food, feed, water, kitchen utensils and fish and other pets. Do not allow children near you when applying pesticides. Wash and clean up after using pesticides - change clothes if any pesticide was spilled. Dispose of empty containers safely. Bury 18" deep in an isolated area away from any water supply or place in a trash container. Do not burn aerosol cans. Store pesticides in their original containers in a locked cabinet or shed away from food. Be sure tops or caps are on tight. In case of an accident, follow label directions and call a physician immediately.

James S. Bowman
Extension Entomologist

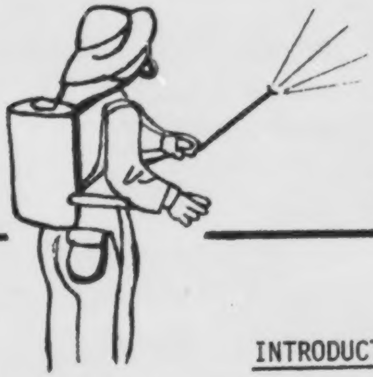
2/76/1.5M

COOPERATIVE EXTENSION SERVICE
University of New Hampshire

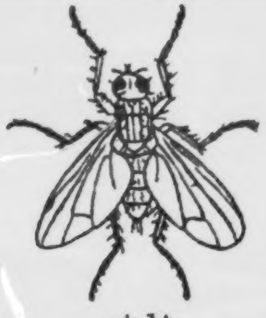
Pest Fact Sheet
No. 28

PESTICIDE APPLICATOR TRAINING

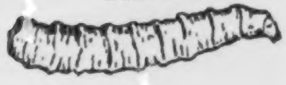
VEGETABLES



CABBAGE MAGGOT



adult



maggot

INTRODUCTION

The Cabbage Maggot, Hylemya brassicae (Bouche), is one of the most destructive early season pests of crucifers and certain root crops in N.H. It can cause severe injury to cabbage, cauliflower, broccoli, Brussel sprouts, radish, turnip, rutabaga, beets, and celery if not kept under control.

DESCRIPTION OF THE CABBAGE MAGGOT

The adult fly is similar in appearance to the common house fly but smaller in size (¼" long). It is dark ashy gray with black stripes on the thorax and black bristles over the body. In the spring it is commonly seen flying close to the ground while it deposits small white eggs in cracks and crevices near the stems of host plants.

The larva which hatches from the eggs is a white legless tapered maggot which feeds on the roots. The maggot later changes to a hard brown egg-shaped puparia about ¼" long and can be found from 1-5" in the soil.

LIFE CYCLE

The Cabbage Maggot spends the winter as a puparia in the soil. When the soil warms up in the spring and about the time transplants are set out, the adults emerge from the soil, mate, and actively begin their egg-laying on the soil near the host plants. The eggs hatch in 3-7 days and the small maggots seek out roots and begin feeding. They destroy the roots by their tunneling habit. This will often cause young cabbage or cauliflower plants to wilt and die. Plants like radish and turnip become scored with feeding trails making them susceptible to attack by disease organisms. The larvae complete development in 3-4 weeks and change to a pupae. In 2-3 weeks, usually in late June and July, the adult will emerge and work its way through the soil to the surface to start a new generation. There are 3-4 generations in New Hampshire.

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CONTROL

CABBAGE, BROCCOLI, CAULIFLOWER, BRUSSEL SPROUTS:

Before Seeding or Transplanting -- Broadcast and work in 3-4"

diazinon	4-6 lbs. 50% WP or 21 lbs. 14G/A

At Time of Seeding or Transplanting -- Apply to furrow or in transplant water (6-8 oz/plant or 300 gal/A)

diazinon	1 lb/A

Post-Planting -- Soil Drench (6-8 oz/plant or 300 gal/A)

diazinon	½ lb ai/A
*Dyfonate**	½-1 lb ai/A

RADISH, TURNIP, RUTABAGA:

At Time of Seeding -- Raw drench or furrow treatment

diazinon	½ lb ai/A

At Post-Emergence (Adult Fly Control) -- at 10-day interval

diazinon	½ lb ai/A
malathion	1 lb ai/A
*parathion**	½ lb ai/A

* Restricted use pesticide in N.H.

SUMMARY

1.	Damaging Stage:	Maggot (Larvae)
2.	Part of Plant Attacked:	Roots
3.	Overwintering Stage:	Puparia (Pupa)
4.	Number of Generations Per Year:	3-4
5.	Time of Year When Damage Done:	May - September
6.	Number of Applications Used:	1-2

SAFE USE OF PESTICIDES

Stop!!! Read the label on every pesticide container each time before using the material. Pesticides must be applied only as directed on the label to be in compliance with the law. Avoid inhaling dusts or sprays. Open windows and ventilate the rooms while using pesticides. Never smoke or eat while spraying or dusting. Remove or cover food, feed, water, kitchen utensils and fish and other pets. Do not allow children near you when applying pesticides. Wash and clean up after using pesticides - change clothes if any pesticide was spilled. Dispose of empty containers safely. Bury 18" deep in an isolated area away from any water supply or place in a trash container. Do not burn aerosol cans. Store pesticides in their original containers in a locked cabinet or shed away from food. Be sure tops or caps are on tight. In case of an accident, follow label directions and call a physician immediately.

James S. Bowman
Extension Entomologist

2/76/1.5M

COOPERATIVE EXTENSION SERVICE

University of New Hampshire

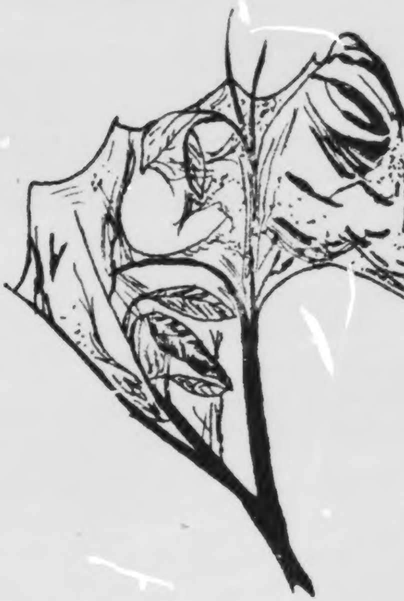
Pest Fact Sheet

No. 29

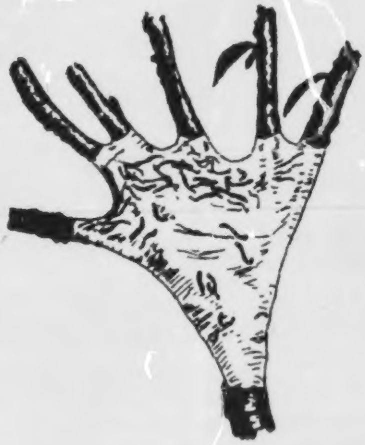
PESTICIDE APPLICATOR TRAINING

ORNAMENTALS

FALL WEBWORM AND EASTERN TENT CATERPILLAR



fall webworm



eastern tent caterpillar

INTRODUCTION

The Fall Webworm (Hyphantria cunea, Drury) and the Eastern Tent Caterpillar (Malacosoma americanum, Fabricius) feed on fruit, shade, and woodland trees. They are of little economic importance in orchards which are regularly sprayed for the control of Codling Moth and other pests, but because they form unsightly webs, they can be considered a significant pest of nurseries and landscape. The Fall Webworm is frequently confused with the Gypsy Moth. The dirty loosely-woven web of the Fall Webworm encloses branches; the larvae can be found feeding within the web. The web of the Eastern Tent Caterpillar, on the other hand, is thickly constructed in the forks and crotches of trees; the larvae do not feed within their webs, but congregate there at night and during rainy weather. Fall Webworm occurs in the fall, whereas Eastern Tent Caterpillar occurs in the spring.

DESCRIPTION

FALL WEBWORM: The full-grown larvae are about 1½" long. They may be yellow with dark stripes and spots, or they may be dull bluish black with no yellow. The body is very hairy and the head is dark. The adult moths have a wingspan of 1½". Their color is nearly pure white.

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EASTERN TENT CATERPILLAR: The full-grown larvae are about 2" long and have sparse hairs. They are black with white and blue markings and have a white stripe down the middle of the back. The adult moths are reddish-brown in color with two whitish stripes running obliquely across each forewing.

LIFE CYCLE

FALL WEBWORM: There is one generation of the Fall Webworm per year. It overwinters as a pupa in the soil. In June and July, adult moths emerge from the soil and the females begin laying eggs in July. The eggs begin to hatch in late July - early August, and the larvae feed within the web for a month or more, crawl down the tree, construct a cocoon, and pupate.

EASTERN TENT CATERPILLAR: There is one generation of the Eastern Tent Caterpillar per year. It overwinters in egg masses on twigs of trees. They hatch in the spring, about the time the buds open. After feeding for two days, the larvae weave their tent. Successive layers are added to the tent as the larvae develop. Early in the summer, the larvae spin a cocoon, pupate, and emerge as adults. The females deposit masses of eggs in bands around twigs. The larvae develop inside the eggs, but do not hatch until the next spring.

CONTROL

Early detection of nests of either pest is important to avoid excessive defoliation. Destroying the nests by pruning out or burning can be done to a limited extent. Pesticides should be applied to hard-to-reach infestations or when populations are heavy. Spray foliage with methoxychlor, carbaryl, diazinon, Dylox, or *Bacillus thurengiensis* according to the label.

SUMMARY

	Fall Webworm	E. Tent Caterpillar
1. Damaging Stage:	Larvae	Larvae
2. Part of Plant Attacked:	Leaves	Leaves
3. Overwintering Stage:	Pupa	Egg
4. Number of Generations Per Year:	One	One
5. Time of Year When Damage Done:	Fall	Spring
6. Number of Applications Per Year:	As Needed	As Needed

SAFE USE OF PESTICIDES

Stop!!! Read the label on every pesticide container each time before using the material. Pesticides must be applied only as directed on the label to be in compliance with the law.

James S. Bowman
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2/76/1.5M

COOPERATIVE EXTENSION SERVICE

University of New Hampshire

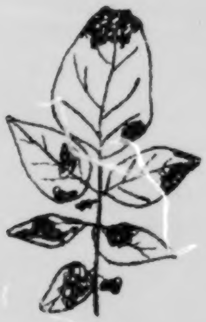
Pest Fact Sheet

No. 30

PESTICIDE APPLICATOR TRAINING

VEGETABLES

LATE BLIGHT OF POTATO



INTRODUCTION

Late Blight of Potato, a fungus disease caused by Phytophthora infestans, has a great potential for damage during favorable weather conditions. Prolonged periods of cool, wet weather provided the conditions for Late Blight to completely wipe out the potato crop in Ireland in 1845 causing the Irish Famine. Late Blight is found in nearly all areas of the world where potatoes are grown and is a major disease in cool, humid regions of the temperate zone. New Hampshire weather conditions are often highly favorable for Late Blight development.

DESCRIPTION OF LATE BLIGHT

Foliage symptoms first appear as circular or irregular water-soaked spots. In moist weather, the spots enlarge rapidly and form brown, blighted areas with a yellowish-white ring often surrounding the margin of the lesion. Soon the entire leaflet and then all the leaflets on a leaf die and become limp (blighted). Under continuously wet conditions, all tender, above-ground parts of the plant blight and rot away, giving a characteristic odor. In dry weather, the lesions stop enlarging.

Affected tubers show irregular purplish-black or brownish blotches which look like a black eye. Later, the affected areas become firm and dry and somewhat sunken. They may be small or may occupy the entire surface and the rot may go deeper.

CONTROL

Cultural Practices: destroy cull piles, avoid volunteers (harvest as completely as possible, till fields thoroughly prior to planting), make sure vines are killed (by chemical vine killer or frost) before digging.

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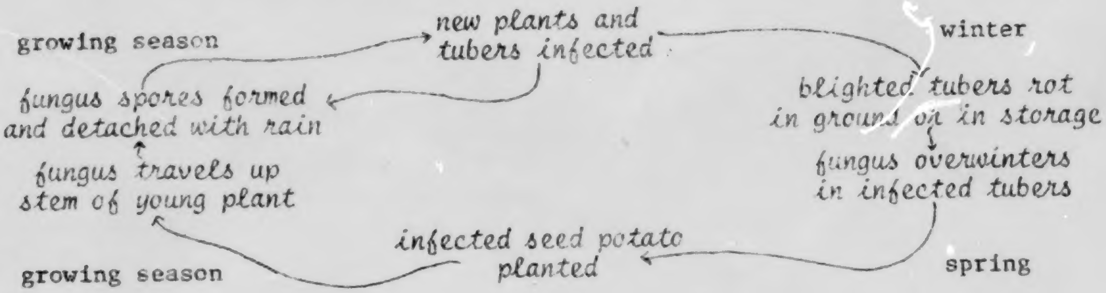
Spray Schedule: Begin fungicide applications when plants are about 8 inches high and continue as long as green foliage remains in the field. All fungicides are applied as protectant sprays.

FUNGICIDE	LATE BLIGHT ABSENT/ WEATHER UNFAVORABLE		LATE BLIGHT PRESENT/ WEATHER FAVORABLE		DAYS TO HARVEST
	RATE/A	INTERVAL	RATE/A	INTERVAL	
mancozeb (Dithane M-45 or Manzate) 80% WP	1.5 lbs.	7 days	2 lbs.	5-7 days	0
maneb 80%	1.5 lbs.	7 days	2 lbs.	5-7 days	0
Polyram 80% WP	1.5 lbs.	7 days	2 lbs.	5-7 days	0
captafol (Difolatan) 4F	2.5 pts.	7 days	3 pts.	5-7 days	0
chlorothalonil (Bravo) 6F	1.0 pts.	7 days	1.5 pts.	5-7 days	0

weather favorable for blight development: cool, moist

weather unfavorable for blight development: warm, dry

LIFE CYCLE


growing season
new plants and tubers infected
winter
fungus spores formed and detached with rain
blighted tubers rot in ground or in storage
fungus travels up stem of young plant
fungus overwinters in infected tubers
infected seed potato planted
growing season
spring

SUMMARY

1. Causal Agent: Fungus
2. Plant Parts Attacked: Foliage and Tubers
3. Major Symptoms: Blighting of Leaves
4. Time of First Noticable Symptoms: When Plants Are Half Grown
5. Spray Program: Protectant Sprays
6. Number of Applications Per Season: 12-15

SAFE USE OF PESTICIDES

Stop!!! Read the label on every pesticide container each time before using the material. Pesticides must be applied only as directed on the label to be in compliance with the law. Avoid inhaling dusts or sprays. Open windows and ventilate the rooms while using pesticides. Never smoke or eat while spraying or dusting. Remove or cover food, feed, water, kitchen utensils and fish and other pets. Do not allow children near you when applying pesticides. Wash and clean up after using pesticides - change clothes if any pesticide was spilled. Dispose of empty containers safely. Bury 18" deep in an isolated area away from any water supply or place in a trash container. Do not burn aerosol cans. Store pesticides in their original containers in a locked cabinet or shed away from food. Be sure tops or caps are on tight. In case of an accident, follow label directions and call a physician immediately.

William E. MacHardy
Extension Plant Pathologist

2/76/1.5M

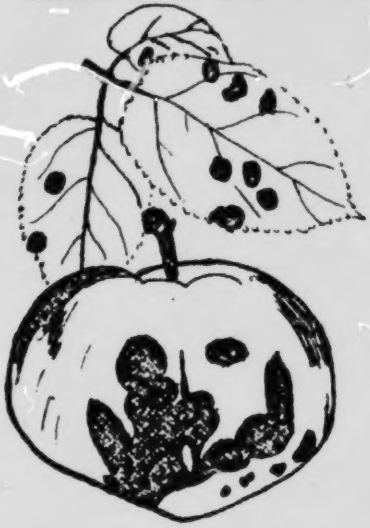
COOPERATIVE EXTENSION SERVICE
University of New Hampshire

Pest Fact Sheet
No. 31

PESTICIDE APPLICATOR TRAINING

TREE FRUIT

APPLE SCAB



INTRODUCTION

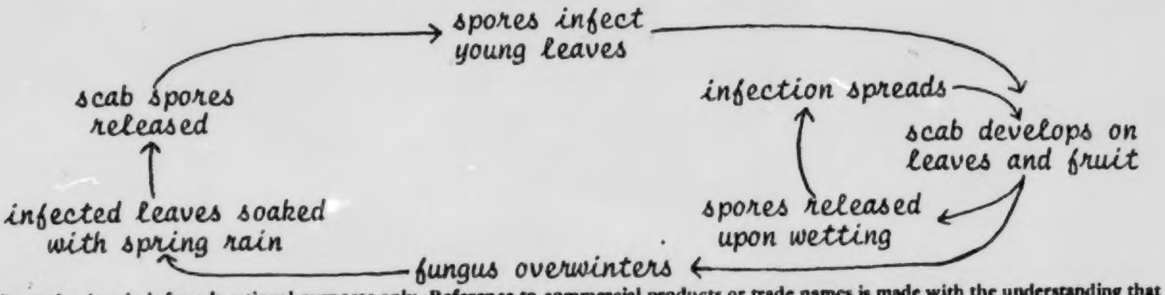
Apple Scab is a fungus disease that occurs whereever apples are grown. It is most severe in areas where the climate is cool and moist; thus, New Hampshire is an area particularly vulnerable to Apple Scab. It is more of a problem today than 50 years ago because of the increased production of highly susceptible varieties of apples (such as McIntosh) and the subsequent build-up of the Apple Scab pathogen. Apple Scab is a significant, economic disease of apples which reduces the size and quality of the infected fruit and reduces the length of time the fruit can remain in storage.

DESCRIPTION OF APPLE SCAB

The symptoms appear on both leaves and fruit. Lesions on the leaf first appear as olive-colored irregular spots that later become larger and velvety as the leaf develops. The number of lesions per leaf varies with the severity of the infection. They may remain distinct or may coalesce. After severe early infection the leaves may curl and fall.

Infections of the fruit appear as distinct, almost circular scab lesions at first velvety and olive-green but later become darker, scabby, and sometimes cracked. Severe early infection of fruit results in deformed, cracked fruit which may drop. Late infections may develop into dark scab spots during storage. Multiple infections occur throughout each season.

LIFE CYCLE


spores infect young leaves
infection spreads
scab develops on leaves and fruit
spores released upon wetting
fungus overwinters
infected leaves soaked with spring rain
scab spores released

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CONTROL

Apply protectant fungicide sprays at green tip (when first susceptible tissue emerges from the bud and first primary spores are discharged), half-inch green, tight cluster, pink, bloom, and petal fall to protect developing leaves, flowers, and fruit from infection during this critical part of the growing season. The interval between these sprays is generally 3-8 days, depending on the rainfall and the rate of growth. Apply cover sprays throughout the summer at 7-14 day intervals, depending on the weather.

FUNGICIDE	RATE/100 GALS.	RATE/ACRE	AFTER-INFECTION ACTIVITY[1]	DAYS TO HARVEST
benomyl (Benlate) 50WP	4-6 oz.	12-18 oz.	18-24 hrs.	0
captan 50WP	1 lb.	3 lb.	18-24 hrs.	0
dichlone (Phygon) 50WP	4 oz.	12 oz.	30-36 hrs.	PF[2]
dodine (Cyprex) 65WP	6 oz.	18 oz.	18-24 hrs.	5
Dikar 80WP	2 lb.	6 lb.	none	30
ferbam (Fermate) 76WP	1½ lb.	4½ lb.	none	7
maneb/zinc 80WP	1½ lb.	4½ lb.	18-24 hrs.	30
Polyram 80WP	1-1½ lb.	3-4½ lb.	18-24 hrs.	30
thiram (Thylate) 65WP	4-6 oz.	12-18 oz.	15-20 hrs.	0

[1] Hours from beginning of rain resulting in an infection period at optimum temperatures (50-60°F) for scab development. At 50°F the eradication period is the higher figure given; at 60°F it is the lower time period. The fungicides will provide effective eradicant action if applied within the time period listed.

Use as an emergency measure after infection is presumed to have taken place, but before the time limit of after-infection activity for the fungicide has been exceeded.

[2] Not recommended for use on Red Delicious or Golden Delicious or after Petal Fall.

SUMMARY

1.	Causal Agent:	Fungus
2.	Plant Parts Attacked:	Foliage and Fruit
3.	Major Symptoms:	Scab Lesions on Foliage and Fruit
4.	Time of First Noticable Symptoms:	When Leaves Become Fully Expanded
5.	Spray Program:	Protectant Sprays with Eradicant Sprays when Necessary
6.	Number of Applications Per Season:	12-15

SAFE USE OF PESTICIDES

Stop!!! Read the label on every pesticide container each time before using the material. Pesticides must be applied only as directed on the label to be in compliance with the law.

William E. MacHardy
Extension Plant Pathologist

3/76/1.5M-es

COOPERATIVE EXTENSION SERVICE

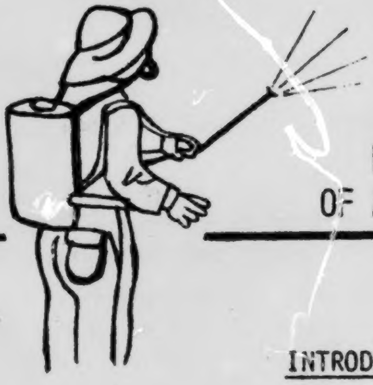
University of New Hampshire

PESTICIDE APPLICATOR TRAINING

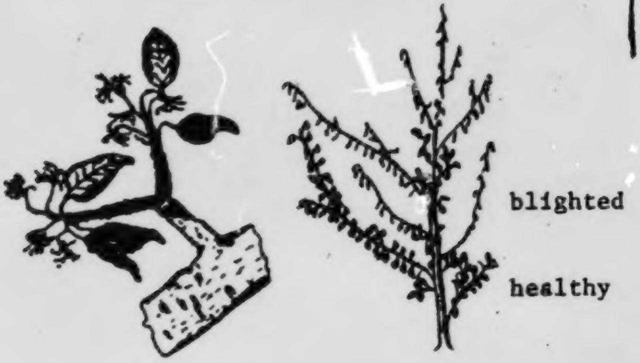
TREE FRUIT

Pest Fact Sheet

No. 32



FIRE BLIGHT OF APPLE AND PEAR



INTRODUCTION

Fire blight, caused by a bacterium, is one of the most destructive diseases of apples and pears. It is found almost every year to some extent in New Hampshire and in other major apple and pear growing regions of the United States. The annual loss of blossoms and fruit along with the destruction of scaffold limbs make fire blight the most feared of all apple and pear diseases.

DESCRIPTION OF FIRE BLIGHT

Fire blight is most damaging during warm, humid weather. Blossoms, twigs, leaves, and fruits can all be infected. Usually it is characterized by sudden wilting followed by shriveling and blackening of the blossoms and young shoots. A characteristic symptom of terminal blight is the bending of the blighted terminal to resemble a shepherd's crook. The dead leaves do not fall, but remain on the tree giving the appearance of having been scorched by fire; hence the name "fireblight." The disease is first observed following the blossoming period.

Dark, sunken cankers are formed on the larger branches. The cankers are usually separated from the healthy bark by narrow cracks. These cankers slowly enlarge and eventually may girdle the limb. During moist weather, drops of bacterial ooze are produced on the canker surface.

LIFE CYCLE

The bacterium overwinters in the live bark at the edge of the cankers on the larger branches. In the spring sticky amber-colored droplets containing millions of bacteria ooze from these cankers and spread to blossoms, twigs, and branches by rain, insects, and pruning tools. Injuries in leaves and twigs due to hail increase the spread and development of fire blight. Infection may be evident within a week.

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A combination of warm temperatures (65° to 85°F) and high humidity created by rain and fog, along with highly succulent growth, favor blight development. Excessive nitrogen fertilization, late fertilizer application, poor soil drainage and other factors which promote succulent growth or delay hardening of the tissue near the end of the summer tend to increase disease severity.

CONTROL

Fire blight damage is best reduced by a combination of sanitation and chemical sprays.

Cultural Practices: Factors that favor succulent growth and production of blossoms also favor development of fire blight. Fertilization should be carefully regulated to prevent succulent growth and over-production of shoots.

On young trees, cut out and burn infected twigs as soon as they can be seen, especially in early summer. Cut at least 12 inches below the edge of the infected area or canker and sterilize cutting tools after each cut with a disinfectant to avoid further spread of the bacteria. A 70% denatured (rubbing) alcohol, 5% lysol or 10% household bleach (one part bleach to 9 parts water) are satisfactory.

During the winter or early spring before growth resumes, all infections from the previous year should be cut out and burned, making cuts four inches below the lower edge of the canker or infected twig. There is no need to disinfect cutting tools during the dormant season.

Chemical Control: Control of blossom infection is the key to the control of subsequent secondary infection, because without blossom infection there is little opportunity for the bacteria to increase sufficiently to cause significant shoot infection. Infection within shoots can only be stopped by pruning the infected shoot.

Blossoms are the most susceptible part of the plant, but infection can be reduced by proper timing of protectant sprays containing Streptomycin (an antibiotic) at the rate of 100 ppm.

Apply the first spray just before blossoms open (full pink stage) and repeat at 4 to 7-day intervals through the blossoming season (3-4 sprays).

Streptomycin is most effective when used alone, but may be combined safely with captan, copper fungicide, ferbam, lime sulfur, wettable sulfur and zineb. Do not combine Streptomycin with chlordane, Glyodin, or lindane. Thorough coverage from both sides is essential. Use about 10 gallons of spray for each mature tree. Spray blossoms thoroughly on fire blight-susceptible trees where disease has been a problem in the past.

SUMMARY

1. Causal Agent: Bacterium
2. Major Disease Symptoms: Leaf and Shoot Blight; Cankers
3. Parts Infected: Leaves, Flowers, Fruits, Branches
4. First Noticable Symptoms: Immediately After Blossoming
5. Spray Program: Protectant Sprays
6. Number of Spray Applications: 3-4

SAFE USE OF PESTICIDES

Stop!!! Read the label on every pesticide container each time before using t the material. Pesticides must be applied only as directed on the label.

3/76/1.5M-es

William E. MacHardy
Extension Plant Pathologist

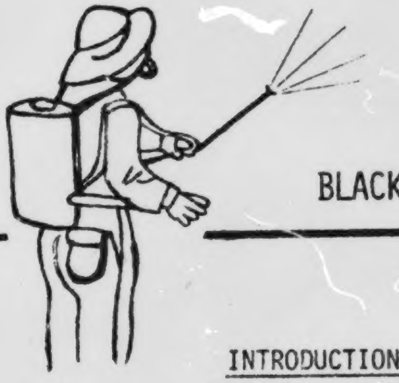
COOPERATIVE EXTENSION SERVICE

University of New Hampshire

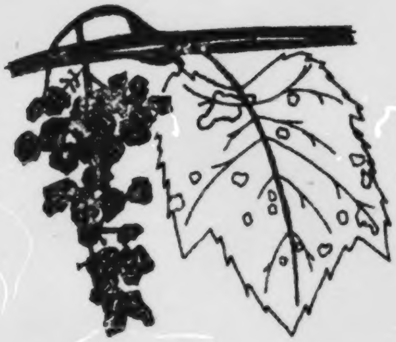
Pest Fact Sheet
No. 33

PESTICIDE APPLICATOR TRAINING

SMALL FRUIT



BLACK ROT OF GRAPE



INTRODUCTION

Black rot, a fungus disease, is the most widespread disease of grapes, and in the Eastern grape-producing regions it causes greater loss than all other diseases combined. The black rot fungus can infect all green parts of the vine, but the grapes are most severely damaged.

DESCRIPTION OF BLACK ROT OF GRAPE

The fungus attacks the leaves, young canes, tendrils and fruit. Only the youngest tissues are susceptible except the fruit, which may become infected until almost fully grown.

Symptoms on Leaves: First symptoms appear as reddish-brown, somewhat circular spots scattered over the upper surface of the leaf between the veins. Later the center of the spot turns lighter brown while the outer portion remains a darker brown and the margin black. An important diagnostic feature is the presence of small, black, pimple-like bodies (actually fungal reproductive structures) just inside the margin of the spot. Spotting occurs on the leaves and vines early in the spring, but it is usually midsummer, when the nearly half-grown berries begin to discolor and dry, that the disease is first noticed.

Symptoms on Stems, Stalks, and Shoots: Purple to black, elongated depressed lesions appear on all these parts. The small, black fungal fruiting structures are scattered over the lesion surface.

Symptoms on Fruit: Infection appears as a small whitish spot that is soon circled by a brown ring. The ring spreads rapidly and within 48 hours may cover half the berry. About the same time the center of the spot becomes wrinkled, depressed, and black in color. This also happens fast (within 36 hours). The berry may be black and shriveled. The final stage is a mummified berry, its surface studded with the small, black fungal fruiting structures.

LIFE CYCLE

Fungal spores are produced during warm, moist weather in the spring months when

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the grape plant is just beginning its new growth. Air currents and rain water carry the spores to the young grape plant parts and fruit where infection takes place. The first infections provide the spores that cause repeated secondary infections during wet periods until late summer.

CONDITIONS FAVORING BLACK ROT

The mummified fruit and lesions on the plants must be water-soaked before the spores can escape. Therefore, infection takes place only during humid periods 2 to 3 days long. In the course of a growing season there is a new infection period following each rainy spell; symptoms become evident on plant parts about 10 to 14 days following infection.

CONTROL

Early season protectant sprays are very important to control black rot, because if the vines are not sprayed early with the proper fungicide the fungus may attack the young shoots and leaves and build up a reservoir of spores capable of infecting the fruit later in the season.

FUNGICIDE*	lb./100 gal.	DAYS-TO-HARVEST
ferbam 76% WP (Fermate)	2	7
benomyl 50% WP (Benlate)	½	7
folpet 50% WP (Phaltan)	2	0
captan 50% WP	2	0

Spray (1) when buds first open (showing green), (2) when shoots are 6 to 10" long, (3) when blossoms are beginning to open, (4) immediately after bloom, (5) when berries are pea size, (6) when berries in the clusters nearly touch and (7) when fruit starts to color.

*ferbam is most generally recommended for black rot control.

Benomyl is effective in controlling black rot and powdery mildew but not downy mildew. Captan is effective in controlling black rot and downy mildew but not powdery mildew. Folpet is effective in controlling black rot, powdery mildew, and downy mildew.

SUMMARY

1.	Causal Agent:	Fungus
2.	Plant Parts Attacked:	Leaves, Stems, Fruit
3.	Major Symptoms:	Spots, Lesions, Mummies
4.	Time of First Noticable Symptoms:	Leaves: Early Spring; Berries: Mid-Summer
5.	Spray Program:	Protectant Sprays
6.	Number of Applications Per Season:	7

SAFE USE OF PESTICIDES

Stop!!! Read the label on every pesticide container each time before using the material. Pesticides must be applied only as directed on the label to be in compliance with the law.

William E. MacHardy
Extension Plant Pathologist

2/76/1.5M-es

COOPERATIVE EXTENSION SERVICE

University of New Hampshire

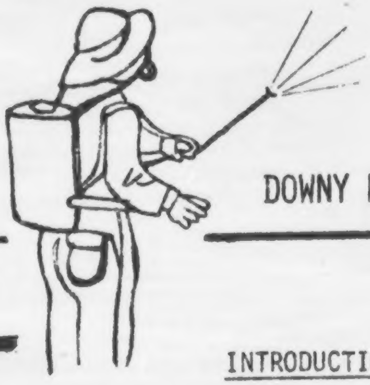
Pest Fact Sheet

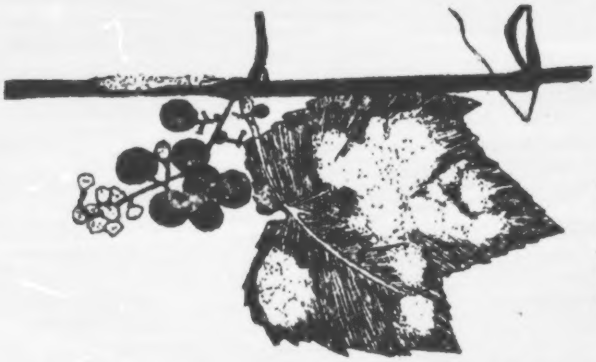
No. 34

PESTICIDE APPLICATOR TRAINING

SMALL FRUIT

DOWNY MILDEW OF GRAPE





INTRODUCTION

Downy mildew, a fungus disease, primarily attacks the leaves. This disease causes important economic damage to vineyards in the Northeastern States because cool, moist weather is necessary for severe disease build-up.

DESCRIPTION OF DOWNY MILDEW

Damage to the leaves is usually minor before late summer, but this disease becomes increasingly destructive during August and September. First signs of infection on the leaves are light yellow spots. Then a white moldy growth composed of fungus threads and spores forms on the undersides of the leaves. The spots may be few or many. If there are many, they may merge and cover most of the leaf. Affected leaves eventually turn brown, become dry and crumbled and fall. Exposed berries may be scalded by the sun, or, if the vines lose their leaves before the ripening period, berries do not mature normally.

Shoots, tendrils, or berries may be attacked early in the season when they are tender, causing water-soaked depressions and the later appearance of a white moldy growth.

If the berries are attacked, there may be two periods of infection, one in June when the berries are about the size of small peas (infected berries become soft, shatter easily and are frequently covered with a white downy growth) and a second infection later in the season when the nights become cooler (berries infected at this time become brownish, wither and shatter easily).

LIFE CYCLE

The fungus overwinters on old diseased leaves on the ground. In the spring, the fungus becomes active and fungal spores are carried by splashing rain and wind to new leaves or the berries where infection starts. Older leaves in the center of the vine

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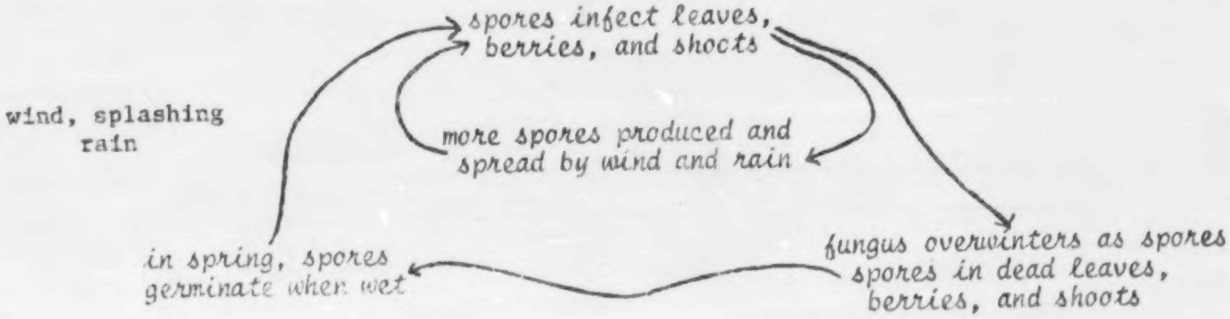
are first to become infected. The disease spreads toward the leaves at the end of the canes as they mature and by autumn, on highly susceptible varieties, even young leaves may die and fall. If the season has been unfavorable for disease development or the grape variety is resistant, only a few of the oldest leaves may show symptoms.


spores infect leaves, berries, and shoots
wind, splashing rain
more spores produced and spread by wind and rain
in spring, spores germinate when wet
fungus overwinters as spores spores in dead leaves, berries, and shoots

CONTROL

Controlling downy mildew becomes more important beginning about mid-season. It is comparatively easy to control, and the fungicides effective against black rot are generally also effective against downy mildew, with the notable exception of benomyl (Benlate) which is not effective in controlling downy mildew.

FUNGICIDE	RATE/100 GAL	DAYS-TO-HARVEST
captan 50% WP or	2	0
ferbam 76% WP or	2	7
folpet (Phaltan) 50% WP	2	0

Ferbam is not as effective against downy mildew as captan or folpet.

Make spray applications (1) when blossoms are beginning to open, followed by additional sprays (2) immediately after bloom, (3) when berries are pea size, (4) when berries in the clusters nearly touch and (5) when fruit first starts to color.

SUMMARY

1. Causal Agent: Fungus
2. Plant Parts Attacked: Leaves, Primarily
3. Major Symptoms: Leaf Spots
4. Time of First Noticable Symptoms: After Leaves are Fully Developed
5. Spray Program: Protectant Sprays
6. Number of Applications Per Season: 5

SAFE USE OF PESTICIDES

Stop!!! Read the label on every pesticide container each time before using the material. Pesticides must be applied only as directed on the label to be in compliance with the law.

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2/76/1.5M-es

COOPERATIVE EXTENSION SERVICE

University of New Hampshire

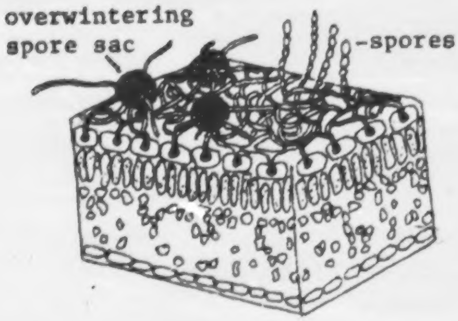
Pest Fact Sheet

No. 35

PESTICIDE APPLICATOR TRAINING

SMALL FRUIT

POWDERY MILDEW OF GRAPE


overwintering spore sac
-spores

fungus growing on upper surface of leaf

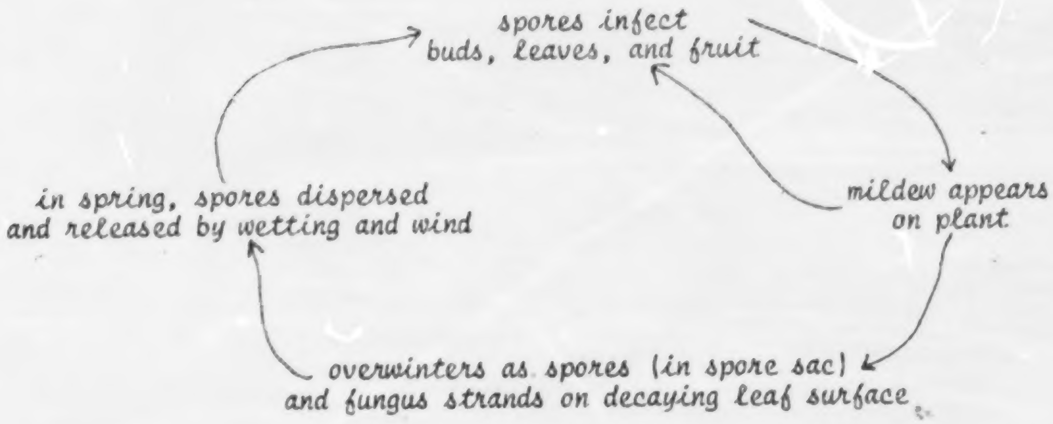
INTRODUCTION

Powdery mildew, a fungus disease, occurs in many vineyards in the Northeast. It is usually of little economic importance on most bunch grape varieties such as Concord, but on Seneca, Interlaken or many of the French hybrids severe losses may result if proper control measures have not been employed.

DESCRIPTION OF POWDERY MILDEW

In the Northeast powdery mildew is largely a disease of the foliage and cluster stems and appears as a white, powdery growth on the upper surface of the leaves and, less commonly, on other green parts of the vine. This powdery growth may be rubbed off with the fingers. Severely affected leaves turn brown and fall. If the berries are infected, they appear rusty or scaly, fail to mature properly and may split. Infection of the cluster stem may cause shelling of the ripe fruit.

LIFE CYCLE


spores infect buds, leaves, and fruit
mildew appears on plant
overwinters as spores (in spore sac) and fungus strands on decaying leaf surface
in spring, spores dispersed and released by wetting and wind

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The fungus overwinters within infected fallen leaves. Powdery mildew (unlike the other two important grape diseases, black rot and downy mildew) is favored by periods of low rainfall and only moderately high relative humidity (70-80%).

CONTROL

FUNGICIDE		RATE/100 GAL.	DAYS BETWEEN LAST SPRAY AND HARVEST
benomyl (Benlate)	50% WP	½ lb.	7
folpet (Phaltan)	50% WP	2 lbs.	0

Benomyl is the most effective powdery mildew fungicide for grapes but should not be used exclusively in a full season program to control this disease because this practice may result in the establishment of fungal populations resistant to benomyl.

SPRAY SCHEDULE:

First Spray:	when blossoms are beginning to open. (Apply at this time only if powdery mildew was a serious problem the previous year.)
Second Spray:	immediately after bloom
Third Spray:	when berries are pea size
Fourth Spray:	when berries in the clusters nearly touch
Fifth Spray:	when fruit first starts to color

SUMMARY

1. Causal Agent:	Fungus
2. Plant Parts Attacked:	Leaves, Primarily
3. Major Symptoms:	White, Powdery Covering on Upper Leaf Surface
4. Time of First Noticable Symptoms:	Leaves Fully Grown
5. Spray Program:	Protectant Sprays
6. Number of Applications Per Season:	4 or 5

SAFE USE OF PESTICIDES

Stop!!! Read the label on every pesticide container each time before using the material. Pesticides must be applied only as directed on the label to be in compliance with the law. Avoid inhaling dusts or sprays. Open windows and ventilate the rooms while using pesticides. Never smoke or eat while spraying or dusting. Remove or cover food, feed, water, kitchen utensils and fish and other pets. Do not allow children near you when applying pesticides. Wash and clean up after using pesticides - change clothes if any pesticide was spilled. Dispose of empty containers safely. Bury 18" deep in an isolated area away from any water supply or place in a trash container. Do not burn aerosol cans. Store pesticides in their original containers in a locked cabinet or shed away from food. Be sure tops or caps are on tight. In case of an accident, follow label directions and call a physician immediately.

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3/76/1.5M-es

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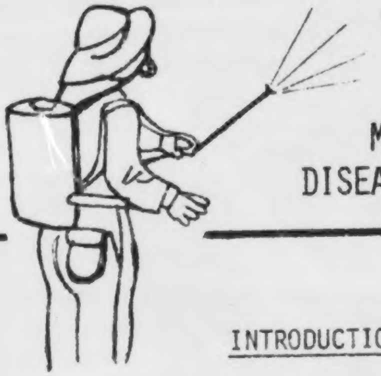
University of New Hampshire

Pest Fact Sheet

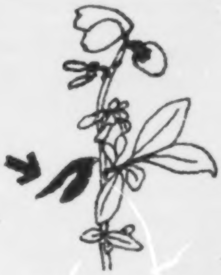
No. 36

PESTICIDE APPLICATOR TRAINING

SMALL FRUIT



MUMMY BERRY DISEASE OF BLUEBERRY



leaf blight

INTRODUCTION

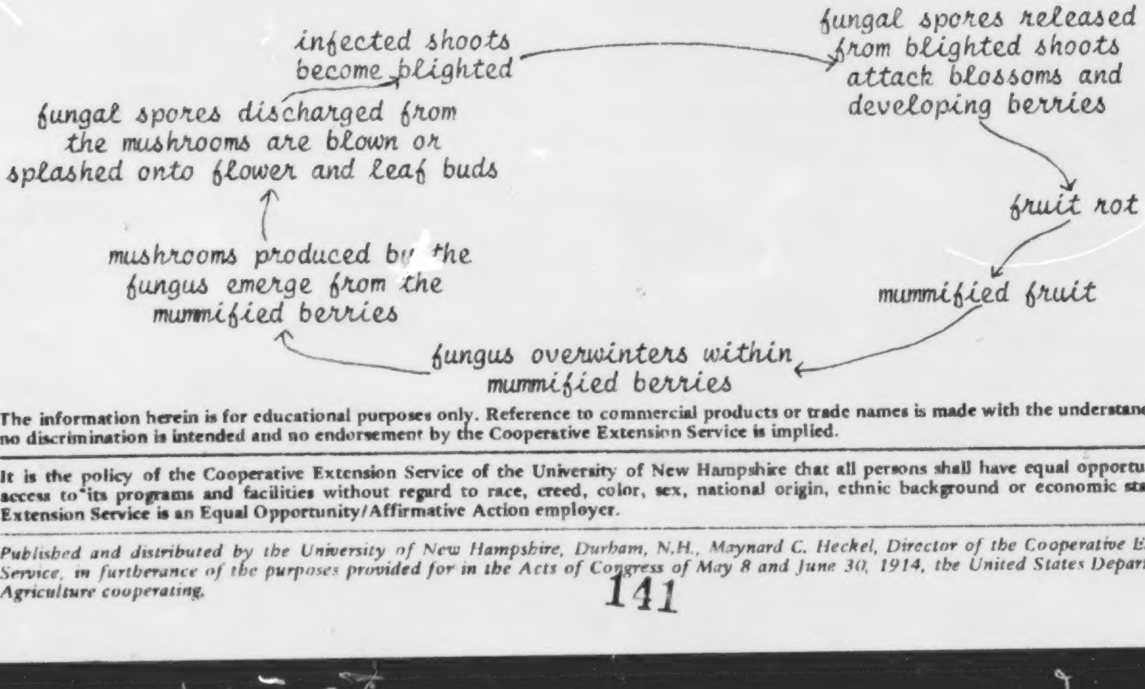
Mummy berry, caused by a fungus, is perennially the most serious disease of blueberries in New Hampshire. The disease causes direct loss of fruit and may reduce the bearing surface of affected bushed through repeated annual leaf and twig blights

DISCRIPTION OF MUMMY BERRY DISEASE

Symptoms of Leaf and Bud Blight Stage: Tender, young tissues become infected and wilt, turn brown, and die. In severe infections dead leaves and shoots give the plant a scorched appearance. The twigs remain on the plants for a number of days and then fall off, leaving a normal-appearing foliage.

Symptoms of Flower and Fruit Infection Stage: Before the blighted twigs fall off the bushes, the fungus produces spores that are blown or splashed onto opening flowers, resulting in infection of the developing berries. However, the infection is not apparent until the fruit begins to ripen. Then, infected fruit becomes pale pink to gray-white compared to the normal blue coloration. The infected fruit falls to the ground and dries into mummies. The fungus overwinters within these mummified berries.

LIFE CYCLE


infected shoots become blighted
fungal spores released from blighted shoots attack blossoms and developing berries
fruit rot
mummified fruit
fungus overwinters within mummified berries
mushrooms produced by the fungus emerge from the mummified berries
fungal spores discharged from the mushrooms are blown or splashed onto flower and leaf buds

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CONTROL

Mummy berry is difficult to control, mainly because no fungicide now registered for blueberries will effectively prevent infection, although several fungicides not now registered for blueberries look very promising.

Sanitary measures may help. The mushrooms can be removed or raked into the center of rows and disked under. At least two inches of soil must cover the mummified berries, otherwise the mushrooms will grow through the soil to the surface. Various herbicides and caustic agents have been used to chemically "burn" the mushrooms.

Some varieties such as Collins, Darrow, and Bluetta show some resistance but may become infected if no control measures are employed and prolonged conditions highly favorable for disease development exist.

If protectant fungicide sprays are used to control the twig blight and berry infection stages, the first spray should be applied when the buds have swollen and the earliest ones have begun to open followed by additional sprays at 7- to 10-day intervals for a total of five sprays.

Early sprays are critical because the spores are first released and infection takes place in the early spring during wet periods from the time that the buds begin to swell until the blossoms have set fruit. The bushes must be covered before wet periods during this time.

SUMMARY

1. Causal Agent:	Fungus
2. Major Symptoms:	Leaf and Twig Blight; Mummified berries
3. First Noticable Symptoms:	Bud Stage; Early Spring Growth
4. Spray Schedule:	Protectant Sprays
5. Number of Applications Per Season:	5

SAFE USE OF PESTICIDES

Stop!!! Read the label on every pesticide container each time before using the material. Pesticides must be applied only as directed on the label to be in compliance with the law. Avoid inhaling dusts or sprays. Open windows and ventilate the rooms while using pesticides. Never smoke or eat while spraying or dusting. Remove or cover food, feed, water, kitchen utensils and fish and other pets. Do not allow children near you when applying pesticides. Wash and clean up after using pesticides - change clothes if any pesticide was spilled. Dispose of empty containers safely. Bury 18" deep in an isolated area away from any water supply or place in a trash container. Do not burn aerosol cans. Store pesticides in their original containers in a locked cabinet or shed away from food. Be sure tops or caps are on tight. In case of accident, follow label directions and call a physician immediately.

William E. MacHardy
Extension Plant Pathologist

3/76/1.5M-es

COOPERATIVE EXTENSION SERVICE

University of New Hampshire

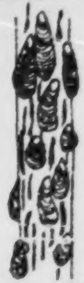
Pest Fact Sheet

No. 37

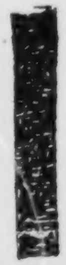
PESTICIDE APPLICATOR TRAINING

ORNAMENTALS

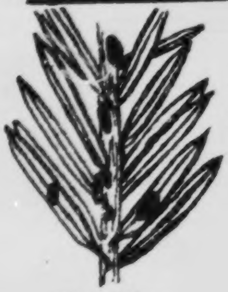
SCALE INSECTS



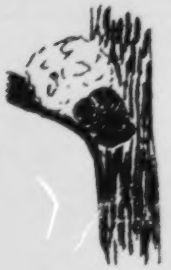
Oyster Shell Scale



Euonymus Scale



Fletcher Scale



Cottony Maple Scale

DESCRIPTION OF SCALE INSECTS

In appearance, scales in general show little resemblance to the typical insects. They are well protected because they live under a waxy, almost impermeable shell. The female lays her eggs under the shell which offers them protection. When the eggs hatch, the "crawler" stage is motile and will crawl about on the host plant to select a feeding site. It is during the crawler stage of development that scales are easily killed with insecticides.

Except for the males of some species, adult scales are permantly affixed to a position selected during the crawler stage. Scale infestations frequently go undetected until the infected plant is completely encrusted. The needle-like mouth parts are inserted into the plant and sap is withdrawn. Scales also secrete a clear sticky substance called honeydew which will coat objects below infested plants. Honeydew in turn will support the growth of a black fungus called sooty mold.

Scale insects vary in size, shape, color, host preference, and life cycle. The following species are common to New Hampshire trees and shrubs.

1. Oyster Shell Scale: Brown oyster shell shape about 1/8" long. They are found on twigs of lilac, ash, red bud, dogwood, poplar, willow, horsechestnut, elm, beech, walnut, cottoneaster, apple, birch, pachysandra, and others. The winter is passed as white eggs under the scale coverings. The eggs hatch in May, about the time the lilac blooms begin to fade. They become mature by August. There is one generation per year.

2. Euonymus Scale: This scale is obvious as brownish encrustations of the stems and twigs, and whitish spotting of the leaves, mainly on the underside. The primary

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host is euonymus, but it is also found on pachysandra and celastris (bittersweet). The winter is spent as the female on the stems and leaves. The young crawlers are produced in May or early June. A second generation occurs in mid-summer.

3. Fletcher Scale: The adult female is light yellowish-brown, almost globular, and about 3-5 mm in diameter. It commonly attacks Taxus, juniper, and arborvitae. It overwinters as a female and the eggs are laid in late May and hatch by early July. Foliage on the inner portions of heavily infested plants is often blackened by the sooty mold growing on the honeydew excreted by the scales. There is one generation per year with crawlers appearing again.

4. Cottony Maple Scale: This scale is best identified by the mass of white wax protruding from beneath brown scales, about ¼" long. It is found on maple, boxelder, basswood, ash, sycamore, beech, black locust, willow, poplar, and occasionally elm; the favorite host is silver maple. The overwintering female lays eggs from April to June and they hatch in June and July. In heavy infestations branches may be killed, the foliage turns a sickly yellow, and honeydew drips on objects below upon which sooty mold grows.

CONTROL

SPECIES	STAGE	WHERE TO TREAT	WHEN TO TREAT	WHAT TO USE
Oyster Shell Scale	Egg	Bark of Twigs and Branches	April	60-70 sec. oil or oil + ethion
	Crawler	Bark of Twigs and branches	Late May to Early June	carbaryl or malathion + methoxychlor
Euonymus Scale	Nymph	Twigs and Stems	Mid-April to Early May	60-70 sec. oil or oil + ethion
	Crawler	Twigs and Stems	Early to Mid-June	malathion + methoxychlor or dimethoate or *Meta-Systox-R** or carbaryl
Fletcher Scale	Nymph	Foliage and Twigs	Mid-April to Early May	60-70 sec. oil or oil + *Guthion**
	Crawler	Foliage and Twigs	July and Sept.	malathion or carbaryl or diazinon or *Meta-Systox-R**
Cottony Maple Scale	Crawler	Twigs	Late June and July	malathion or carbaryl

* Restricted use pesticide in N.H.

SAFE USE OF PESTICIDES

Stop!!! Read the label on every pesticide container each time before using the material. Pesticides must be applied only as directed on the label to be in compliance with the law.

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Extension Entomologist

2/76/1.5M-es

COOPERATIVE EXTENSION SERVICE

University of New Hampshire

Pest Fact Sheet

No. 38

PESTICIDE APPLICATOR TRAINING

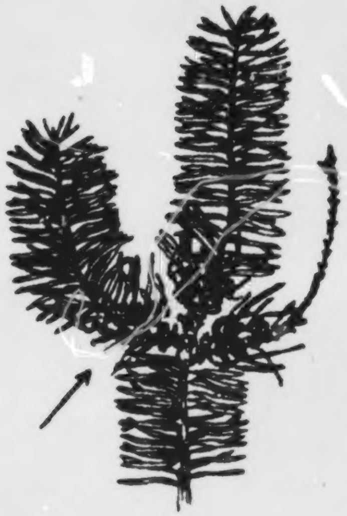
ORNAMENTALS

SPRUCE GALL APHIDS

INTRODUCTION

Most spruce trees are damaged by one of two species of aphids, the Eastern spruce gall aphid (*Adelges abietis* L.) and the Cooley spruce gall aphid (*Adelges cooleyi* Gill.). With their sucking mouthparts, they feed on plant juices causing an irritation to adjacent plant tissue which then develops into cone-like galls which are characteristic in form and shape for the aphid species involved. Continued infestations will disfigure ornamental trees, weakening them and making them subject to attack by other pest organisms.

DESCRIPTION AND LIFE CYCLE



Eastern Spruce Gall Aphid: Galls caused by this insect occur mostly on Norway, white, black, and red spruce trees. An infestation does not spread rapidly from one tree to another. It is not unusual to find specific trees in a planting rather heavily infested year after year while others of the same species may escape injury.

The Eastern spruce gall aphid lives during the winter as an immature female, usually located in a crevice at the base of a spruce bud. It begins feeding in early spring and in May deposits a mass of eggs which is covered with waxy threads. The eggs hatch about the time the shucks break away from the bud and expose the new needles. The newly hatched aphids crawl into the mass of new needles to feed. The swelling needle bases develop into a compact mass and form the pineapple-shaped gall with many individual cells, each inhabited by many aphids. In late July or August, the cells open and the aphids escape. These escapees deposit the eggs producing the individuals which live through the winter.

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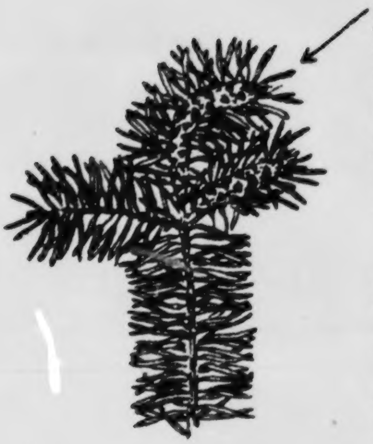


Cooley Spruce Gall Aphid: Galls caused by the Cooley spruce gall aphid occur on Colorado blue spruce, Sitka spruce, and Engelmann spruce. The galls are somewhat larger than those caused by the Eastern spruce gall aphid and occur on the tips of twigs. The growing gall varies from light green to dark purple. It may be 1 to 2" in length and ½ to 3/4" in diameter.

The life history of this aphid, when it remains on spruce, is similar to that of the Eastern spruce gall aphid. However, some of the mature aphids emerging from a gall in July or August fly to Douglas fir to lay eggs. The eggs hatch into young aphids which live during the winter on fir and produce a new brood in the spring when growth appears. These feed on the new growth and may cause some distortion but do not form galls.

CONTROL

MATERIAL	WHEN TO TREAT	REMARKS
60 or 70 sec oil or oil + ethion[1]	Before buds break in mid to late April	crevices of bark or tips of twigs and base of buds on Norway and white spruce for Eastern Spruce Gall Aphid and on blue spruce and Douglas fir for Cooley Spruce Gall Aphid
carbaryl (Sevin) or malathion or *endosulfan**	Same as above	same as above

[1] Do not use on blue spruce as it will discolor it.

*Restricted use pesticide in N.H.

SUMMARY

	Eastern Spruce Gall Aphid	Cooley Spruce Gall Aphid
1. Damaging Stage:	Young and Adult	Young and Adult
2. Plant Parts Attacked:	New Needle Mass	New Growth
3. Overwintering Stage:	Immature Female	Young on Doug. Fir or Immature Female on Blue Spruce
4. Number of Generations Per Year:	One	One
5. Time of Year When Damage Done:	Early Spring-Summer	Spring-Summer
6. Number of Applications Per Year:	One	One

SAFE USE OF PESTICIDES

Stop!!! Read the label on every pesticide container each time before using the material. Pesticides must be applied only as directed on the label to be in compliance with the law.

James S. Bowman
Extension Entomologist

3/76/5C-es

COOPERATIVE EXTENSION SERVICE

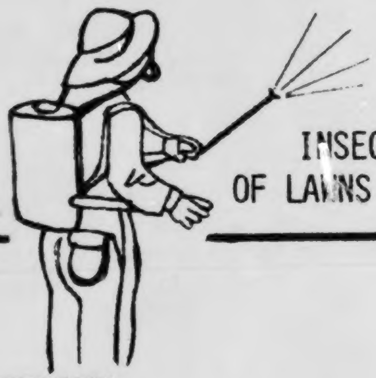
University of New Hampshire

PESTICIDE APPLICATOR TRAINING

TURF

Pest Fact Sheet

No. 39

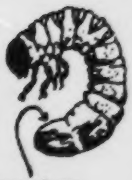


INSECT PESTS OF LAWNS AND TURFGRASS

INTRODUCTION

Lawn and turfgrass are subject to injury by a number of insects. These pests can cause serious damage and result in considerable repair and replacement expenses. However, through the proper use of chemicals and management, these pests can be controlled. For any control program to be effective, the homeowner or commercial turf grower should be familiar with the biology and seasonal development cycle of the various pests.

WHITE GRUBS



White grubs are the larval or grub stage of several species of beetles and chafers. The two most common in New Hampshire are the Japanese Beetle and the June Bugs. These beetle larvae are usually C-shaped (except for the masked chafer), and can be found feeding among the roots of grass. They are typically cream colored with a brown head, and with a dark area at the posterior end where the body contents show through the skin. White grubs feed on grass roots and most complete their development in one year (some June beetles require 2 or 3 years).

Life Cycle and Damage

Summer: Eggs are laid in July and August, the adult beetle selecting the best grass available to deposit the eggs. The young grubs begin feeding on the grass roots within 1 or 2 weeks. Fall: Feeding goes on until fall when the grubs burrow deep into the ground to overwinter. Spring: In the spring, the grubs burrow upwards to the grass root level and resume feeding until late May, when they transform to the pupal stage. Adults begin emerging from the ground about the first week in June for the June Beetle and the first week of July for the Japanese Beetle. See Fact Sheet No. 23 for Life Cycle.

Evidence of an infestation of white grubs appears as areas of grass begin to turn brown (due to root damage). Usually the turf can be rolled back like a rug to reveal the white grubs.

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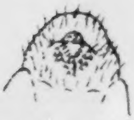
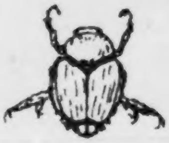
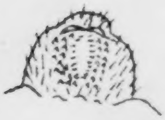
Description of Adults and Grubs

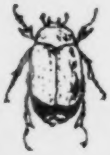
The term "White Grub" is commonly used to describe the larvae of both the Japanese Beetle and the June Beetle. They do similar damage and require similar chemical control measures. However, the biological control using milky spore dust only controls the Japanese Beetle, making it necessary to correctly identify the grub. (See controls)


rastral pattern


adult

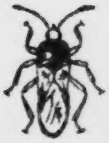
Japanese Beetle: The adult Japanese Beetle is about ½" long, with a shiny metallic-green head and body. The grubs are usually small, with a light brown head. The rastral pattern on the grub forms a V.


rastral pattern


adult

June Beetle: There are over 200 species of these beetles in the U.S. All the adults are brown to nearly black, and range in size from ½" to 1". Most species complete development in a year, although some require 2 or 3 years. The adults are often attracted to lights at night. The grubs are larger than Japanese Beetle grubs, and are usually abundant in cultivated soils and crop areas. The rastral pattern forms an oval.

CHINCH BUGS



Chinch bugs are small, white and black insects that suck sap from grass. They may occur in large numbers and remain unnoticed for some time.

Life Cycle and Damage

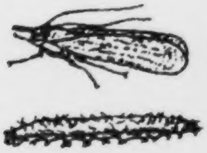
Spring: The overwintering adults emerge and move to the rapidly growing grass plants. The adults feed and begin mating. The females lay about 200 eggs over a 3 to 5 week period. The young bugs (nymphs) begin feeding on the grass within 2 weeks. Summer: The nymphs molt about 5 times to become adults. They continue to feed on the plant sap. The adults in the summer produce a second generation of bugs. Fall: Adults of the second generation hide in grass clumps and leaf litter to spend the winter. When the weather warms in the spring they leave hibernation and search for food.

Most of the damage is caused by the nymphs as they suck plant juices from young grass. An infestation of chinch bugs shows up as yellow patches in the lawn or turf. The injured grass turns yellow, then brown as feeding continues. The chinch bugs concentrate their feeding at the edge of the patch on the healthy grass.

Test for Presence

Cut both ends out of a large tin can. At the edge of an infested or yellow area in the lawn, push one end of the can into the soil. Fill the can with water (keep full), and look for chinch bugs to float to the surface.

SOD WEBWORMS



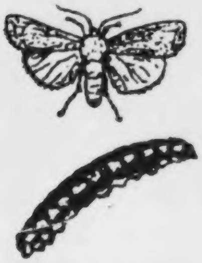
Sod webworms are the larval or caterpillar stage of several species of Lepidoptera. The adults are commonly seen flying in jerky, short flights from place to place as you walk through the grass. They are often seen near lights at night. Although there are several species of sod webworms, they all do similar damage.

Life Cycle and Damage

Spring: When the weather warms, the overwintering caterpillars resume feeding on the grass. Soon the webworm caterpillar is full-grown and forms a pupa. Summer: Adults live for only a short period, they mate and lay eggs in the grass. The caterpillars build silken tunnels at the ground level. They come out at night to feed on the blades of grass. The caterpillars often cut off a piece of grass and return to their tunnel to eat. There may be 2 generations during the summer. Fall: The second generation of caterpillars remain in their tunnels in hibernation during the winter.

Sod webworms seem to prefer new lawns, attacking bentgrass, bluegrass, fescue, etc. Damage first appears as small brown areas in the grass. The turf often has a ragged appearance.

ARMYWORMS AND CUTWORMS

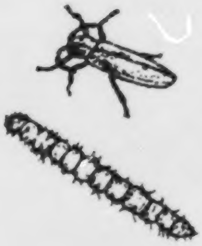


Armyworms and cutworms are the caterpillars of several species of night-flying moths. The caterpillars feed on the above-ground parts of plants (grain and forage crops, grasses, etc.). They are usually considered pests of crops. But infestations are also common in lawns and turf, especially where these areas border crop land or large untended fields. The caterpillars are capable of migrating from one area to another to feed.

Life Cycle and Damage

Spring: The overwintering caterpillars begin feeding when the weather warms. This causes damage to plants early in the growing season. The caterpillars soon become full-grown and form pupae. Summer: Adults appear in June and July. They fly at night and are attracted to lights. The females lay about 500 eggs (over a 2 to 3 week period) on the lower leaves of grasses. The small caterpillars begin feeding immediately, and may migrate to other areas if there is not enough food. The caterpillars usually hide by day and feed at night. There may be a second generation in the summer. Fall: The caterpillars stop feeding in the fall, and either form pupae or seek shelter in dead leaves on the ground to hibernate.

Both the armyworm and cutworm caterpillars can feed on weeds, cultivated plants, and grasses. They infest lawns and feed on grass blades (armyworm) or cut off plants near the soil level (cutworms). The grass takes on a ragged appearance and may turn brown. Since they feed at night, the caterpillars usually go unnoticed.



WIREWORMS

Wireworms are the larvae of certain beetles, commonly known as click-beetles. The "worms" or larvae are brown to dark brown, and smooth or nearly shiny. They can be found just below the grass roots in the soil. The larvae feed on grass roots. The adults do no damage.

CONTROL

	Material	Rate lb.ai/acre	Remarks
Grubs (Japanese and June Beetle)	diazinon or chlorpyrifos (Dursban)	6.0 2.0	Treat annually during July 15 - Aug 31. Apply ½-1" water immediately after treatment.
Japanese Beetle Grubs Only	Milky Spore Disease Dust	8.0 lb. dust	Do not use on areas treated with insecticides. Grubs must be present to spread and maintain disease. Do not expect results for 3-4 years. To prevent damage to good turf, use insecticides.
Hairy Chinchbug	carbaryl (Sevin) or diazinon or Aspon or chlorpyrifos (Dursban)	8.0 4.0 7.0 1.0	Water prior to treatment with liquids and after treatment with granulars. Aspon and Carbaryl are least hazardous. Treatments for grubs are not effective against chinchbugs. Apply treatment in early June. Only one application of Aspon is necessary. A second treatment of other materials may be needed in 2-3 weeks.
Armyworms Cutworms Sod Webworm	carbaryl (Sevin) or diazinon or chlorpyrifos (Dursban)	8.0 6.0 1.0	Evening applications are prefered and should not be watered after treatment. Avoid spraying before rain. Do not cut grass for 1-3 days after treatment.

SAFE USE OF PESTICIDES

Stop!!! Read the label on every pesticide container each time before using the material. Pesticides must be applied only as directed on the label to be in compliance with the law. Avoid inhaling dusts or sprays. Open windows and ventilate the rooms while using pesticides. Never smoke or eat while spraying or dusting. Remove or cover food, feed, water, kitchen utensils and fish and other pets. Do not allow children near you when applying pesticides. Wash and clean up after using pesticides - change clothes if any pesticide was spilled. Dispose of empty containers safely. Bury 18" deep in an isolated area away from any water supply or place in a trash container. Do not burn aerosol cans. Store pesticides in their original containers in a locked cabinet or shed away from food. Be sure tops or caps are on tight. In case of an accident, follow label directions and call a physician immediately.

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3/76/5C-es

COOPERATIVE EXTENSION SERVICE

University of New Hampshire

Pest Fact Sheet

No. 40

PESTICIDE APPLICATOR TRAINING

ORNAMENTALS

SAWFLIES

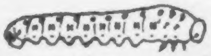
INTRODUCTION

A number of sawfly species are important defoliating pests of ornamental trees in New Hampshire. The damage is done by the larvae which are caterpillar-like, resembling moth or butterfly (lepidopterous) larvae. The way to tell the difference is to count the number of pairs of prolegs on the abdomen; sawfly larvae have 6 or more pairs while lepidopterous larvae have 5 or less pairs which bear small hooks called crochets. Another distinguishing characteristic is the number of eyes on the side of the head capsule. Sawfly larvae have one on each side while lepidopterous larvae usually have 6 on each side. Sawfly larvae often feed in groups (are gregarious) and strip one branch of needles or leaves before moving on to another branch. On conifers they prefer old needles but some species will also feed on new growth. Severe defoliation can cause the trees to die.

When mature, the larvae spin tough capsule-like cocoons on the ground or in the litter; sometimes on the tree. The wasp-like adults emerge from these and lay eggs singly in slits cut in the needles of the food plant. These slits are cut by a saw-like ovipositor, from which sawflies get their name.

The following species of sawflies are important pests in New Hampshire.

Red-Headed Pine Sawfly (*Neodiprion lecontei* Fitch)



This sawfly is one of the most destructive of the native species of sawflies attacking pine. Pines having needles in clusters of two to three are preferred, such as red, Scotch, mugho, jack, pitch, lodgepole, slash, Japanese red, and Virginia pines. Occasionally Eastern white pine may be attacked.

Fully grown larvae are yellowish-white with six rows of conspicuous black spots and the head is reddish.

The winter is spent as a prepupa in a capsule-like cocoon in the ground. After pupation the emerged female lays eggs in the previous years needles. The newly hatched larvae feed in groups on new and old needles defoliating the branches. They become full grown in 25-31 days. When ready to pupate, they drop to the ground and spin a reddish-brown cocoon. There can be more than one generation per year.

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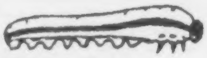
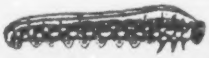
European Pine Sawfly (*Neodiprion sertifer* Geoff)



This species was introduced in the U.S. in 1925 and is now established throughout New England. It prefers red and Scotch pine and also attacks mugho, jack, Japanese red, and Swiss mountain pine. Trees stripped in successive years may die. Full grown larvae are grayish-green and about 7/8" long. There is a lighter longitudinal stripe down the middle with two whitish lines on the sides which border a greenish or blackish stripe which can be broken into a series of spots. The head and thorasic legs are black.

The winter is spent in the egg stage in the old needles and hatch in April to mid-May. The larvae feed gregariously on older needles and do not injure new growth. Pupation occurs in late August or early September. Adults emerge in September and lay eggs in the current needles. There is one generation per year.

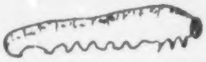
Introduced Pine Sawfly (*Diprion simile* Htg.)



This species was introduced from Europe in 1914 and is now present throughout the northeast. It prefers white pine but also feeds on Scotch, red, jack, and mugho pines. When full grown, the larva is about one inch long with a black head and greenish-yellow body with a double brown or blackish stripe the entire length of the back. The sides of the body are dark brown mottled with yellow and black.

The winter is spent as a prepupa with adults appearing from May to mid-June. The eggs are deposited in the edge of older needles. Young larvae feed gregariously while older larvae feed singly. There can be two and a partial third generation per year.

Larch Sawfly (*Pristiphora erichsonii* Hartig)

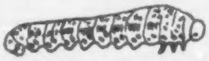


This introduced species was first recorded in Mass. in 1880 and now occurs in the northern tier of states. It's preferred host is larch (tamarack). Fully grown larvae are whitish beneath and gray-green along the dorsum, with a black head.

The winter is spent in the prepupal stage and adults appear from mid-May to August, depending on the location and temperature. Eggs are laid under the bark on current growth and hatch in about 8 days. The young larvae migrate to the foliage of older twigs where they usually feed in groups. After about 20 days they fall to the ground and pupate. There is normally one generation per year.

Defoliated trees are usually not killed because some regrowth during the same season occurs. However, reduction in normal growth occurs.

Mountain Ash Sawfly (*Pristiphora geniculata* Hartig)



This species was introduced from Europe in 1925 and now occurs throughout New England. Its primary hosts are American and European ash. Full grown larvae are pale greenish to yellow with yellow heads and yellow thorasic legs. The body segments are marked with black spots of uneven size and shape, occuring in irregular rows.

The winter is spent in the prepupal stage and adults appear in late May to early July. Eggs are laid in slits around the edge of leaflets and hatch in one week. Newly hatched larvae straddle the edge of leaves and when disturbed, raise their abdomen in the form of an "S". Young larvae are gregarious while older larvae feed singly. Everything is eaten of the leaves except the midribs. Complete defoliation usually does not occur and defoliated trees usually survive.

CONTROL

Sawfly larvae are easily controlled by treating with either methoxychlor or carbaryl when the larvae appear.

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3/76/5C-es

COOPERATIVE EXTENSION SERVICE
University of New Hampshire

Pest Fact Sheet
No. 41

PESTICIDE APPLICATOR TRAINING

TURF

SCLEROTINIA DOLLAR SPOT

INTRODUCTION

Dollar spot fungus affects a wide variety of grasses including Bermudagrass, ryegrass, St. Augustine, zoysia, fescue, and bentgrass.

DESCRIPTION

The overall symptom pattern for Sclerotinia dollar spot varies with mowing practices. Under close mowing, as with golf greens, the disease progresses from the very small initial spots of dead turf to distinctly circular, straw-colored areas 2-3" in diameter, sharply outlined against the surrounding healthy grass. With the higher cutting practices characteristic of home lawns, the small, sharply outlined spots of the golf greens are replaced by larger, irregularly-shaped, straw-colored areas of dead grass ranging from 6-12" in diameter. Under these conditions the disease can be mistaken for drought injury.

Affected individual grass leaves first show yellow-green blotches that become water-soaked and finally bleached to a straw-colored tan with reddish-brown margins. Entire leaves are usually blighted, but in some cases only portions of the leaf tissue are killed. In the early morning hours, while dew is still present on the leaves, a cobwebby white, mold-like growth of the causal fungus appears on the affected leaves.

DISEASE CYCLE

The causal fungus overwinters in or on the soil in the form of hard resting bodies called sclerotia and in the crowns and roots of infected grass plants. In the early summer (when the temperature reaches 60°F) the organism begins growth, reaching a peak of activity during humid weather with temperature from 70°F to 80°F.

Spread of the pathogen to new areas occurs primarily by transport of infected plant material with mowers, traveling irrigators, and other maintenance equipment.

Grass growing under low soil moisture conditions is more susceptible than when adequate soil moisture is provided. Hence, severe outbreaks of the disease can and do occur during seasons of low rainfall.

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Sclerotinia dollar spot is less of a problem in lawngrass growing in soil of high nigrogen fertility. It has been shown, however, that resistance to the pathogen actually decreases with increased nitrogen fertility; and that the beneficial effect of high nitrogen nutrition is due to faster plant recovery during periods unfavorable for disease development. Soil pH does not influence disease development.

CONTROL

FUNGICIDE	RATE IN OZ/1000 SQ.FT. *
Acti-dione/Thiram	3
Daconil 2787	4
Dyrene	4
Tersan 1991	½-1
Cleary 3336	½-1
Fungo	½-1
Spot Kleen	3/8-3/4
Mertect 160	½-1

* Lower rates are to be used for preventive programs, higher rates for curative programs in 5-10 gals. water/1000 sq. ft.

Applications are made from June to September. There is good residual control (4-6 weeks) when systemics are used. Optimum control using protectants is achieved when fungicide applications are made at 7-14 day intervals during periods of disease outbreak.

SUMMARY

1. Causal Agent:	Fungus
2. Plant Parts Attacked:	Leaves
3. Major Symptoms:	Spot in Leaves and Patches in Turf
4. Time of First Noticable Symptoms:	Early Summer
5. Spray Program:	Systemic Fungicides; Protectant Fungicides
6. Number of Applications per Season:	4-6

SAFE USE OF PESTICIDES

Stop!!! Read the label on every pesticide container each time before using the material. Pesticides must be applied only as directed on the label to be in compliance with the law. Avoid inhaling dusts or sprays. Open windows and ventilate the rooms while using pesticides. Never smoke or eat while spraying or dusting. Remove or cover food, feed, water, kitchen utensils and fish and other pets. Do not allow children near you when applying pesticides. Wash and clean up after using pesticides - change clothes if any pesticide was spilled. Dispose of empty containers safely. Bury 18" deep in an isolated area away from any water supply or place in a trash container. Do not burn aerosol cans. Store pesticides in their original containers in a locked cabinet or shed away from food. Be sure tops or caps are on tight. In case of an accident, follow label directions and call a physician immediately.

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3/76/5C-es

COOPERATIVE EXTENSION SERVICE

University of New Hampshire

Pest Fact Sheet

No. 42

PESTICIDE APPLICATOR TRAINING

TURF

HELMINTHOSPORIUM LEAF SPOT

INTRODUCTION

Helminthosporium leaf spot is a common foliage problem of bluegrasses, bentgrasses, fescues, and ryegrasses.

DESCRIPTION

On Bluegrasses: On bluegrasses, the leaf spots are first seen as small, purplish areas. As these spots increase in size, the centers turn brown and eventually fade to a light tan with purplish brown borders. Primary damage caused by the disease comes from blighting of the leaf tissue. This occurs as a rapid collapse and drying of the leaves -- after which they fade to a light straw color. During warm, humid weather of mid-summer, the whole process may occur within a period of 4-5 days from time of infection. The overall disease pattern appears as a brownish fading-out of turfgrass areas of various sizes.

On Bentgrasses: On bentgrasses, the disease is first seen as smoky-blue, irregularly shaped turf areas varying from 1-4 feet in diameter. Soon after, yellowing and complete killing of the grass plants takes place. Finally, these areas appear water-soaked and matted down. The first leaf symptoms are minute yellow flecks which soon progress to irregularly shaped, water-soaked blotches.

DISEASE CYCLE

The causal organism survives the winter in infected plants and infested debris from the previous year's stand. During the growing season, the organism also develops on grass clippings and dead tissues of living grass plants. On Kentucky bluegrass leaves, spores germinate in 30-40 minutes if weather conditions are favorable. At 78°F, a period of 8 to 10 hours with 100% relative humidity is all that is required for a high level of infection to occur.

The first leaf spots usually appear in late spring. Disease severity increases with the onset of warm summer weather and decreases with the cooler fall weather.

The leaf spot phase of disease development is frequently accompanied by a severe crown and root rot that reduces the vigor and drought tolerance of the plants.

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Severity of the disease is directly related to air temperature. At 68°F, leaf spotting occurs, with no leaf blighting; at 75°F, leaf spotting is predominant with a slight blighting occuring; at 85°F, leaf blighting is severe with very little leaf spotting; and at 95°F, leaf blighting is severe with no leaf spots appearing.

CONTROL

Resistant Varieties: The Merion variety of Kentucky bluegrass is more susceptible to Helminthosporium leaf spot than common Kentucky bluegrass.

Chemical Control: Applications can be made from June to September. Optimum control is achieved when fungicide applications are made at 7-14 day intervals during periods of disease outbreak.

FUNGICIDE	RATE IN OZ/1000 SQ.FT. *
Daconil 2787	4-6
Dyrene	4-6
Thiram	4-6
Manzate 200	4-6
Tersan LSR	4-6
Zineb 75%WP	4-6
Dithane M-45 (Fore)	4-6
Acti-dione/Thiram	2-4
Terraclor	4-6

* Lower rates are to be used for preventive programs, higher rates for curative programs in 5-10 gals. water/1000 sq. ft.

SUMMARY

1. Causal Agent:	Fungus
2. Plant Parts Attacked:	Leaves, also Crown and Root
3. Major Symptoms:	Bright Yellow Leaf Blade or Distinct Yellow-Brown Leaf Spots with Darkened Borders
4. Time of First Noticable Symptoms:	Early Summer
5. Spray Program:	Preventive Fungicide Sprays
6. Number of Applications per Season:	1-4 applications

SAFE USE OF PESTICIDES

Stop!!! Read the label on every pesticide container each time before using the material. Pesticides must be applied only as directed on the label to be in compliance with the law. Avoid inhaling dusts or sprays. Open windows and ventilate the rooms while using pesticides. Never smoke or eat while spraying or dusting. Remove or cover food, feed, water, kitchen utensils and fish and other pets. Do not allow children near you when applying pesticides. Wash and clean up after using pesticides - change clothes if any pesticide was spilled. Dispose of empty containers safely. Bury 18" deep in an isolated area away from any water supply or place in a trash container. Do not burn aerosol cans. Store pesticides in their original containers in a locked cabinet or shed away from food. Be sure tops or caps are on tight. In case of an accident, follow label directions and call a physician immediately.

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3/76/5C-es

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University of New Hampshire

Pest Fact Sheet

No. 43

PESTICIDE APPLICATOR TRAINING

TURF

POWDERY MILDEW

INTRODUCTION

Powdery mildew fungus occurs most commonly on the cool-season grasses such as Bermudagrass, bluegrasses, and fescues. It is mosttroublesome in the southernmost parts of the areas in which these grasses are grown.

DESCRIPTION

The fungus is usually first seen as isolated wefts of fine, gray-white cobwebby growth on the upper surface of the leaves. This growth rapidly becomes more dense, and may cover the entire leaf giving it a gray-white appearance. In cases of severe outbreaks, sections of entire grass stands may be dull white, rather than green.

DISEASE CYCLE

The pathogen survives the winter months in dead grass leaves from the previous season, and in a dormant state in infected grass plants.

Fungal spores are spread by air movement and germinate and the infection process begins within two hours from the time they land on the leaf.

Conditions favorable for the development of powdery mildew include: (a) reduced air circulation; (b) high atmospheric humidity, but no free water on the surfaces of the leaves; (c) low light intensity; and (d) an air temperature of 65°F.

The disease is usually more severe on turfgrass growing in shaded areas than in full natural light.

CONTROL

Resistant Varieties: Various grass varieties differ in their susceptibility to powdery mildew. Merion Kentucky bluegrass, for example, is more susceptible to the powdery mildew fungus than common Kentucky bluegrass. However, selection of common Kentucky, solely because of its higher powdery mildew resistance, cannot be justified because of other disease resistance and cultural characteristics entering the picture.

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Cultural Practices: Where powdery mildew is of frequent recurrence, changes to improve air movement and reduce grass shading will aid in disease reduction. Avoid high nitrogen fertility.

Chemical Control: In July-October, a single application of suitable fungicide after the disease appears will often give satisfactory control, but 2-3 applications at 4-6 day intervals may be required for complete eradication if the outbreak is severe.

FUNGICIDE	RATE IN OZ/100 SQ. FT. *
Acti-dione/Thiram	4
Karathane 22.5% WP	¼-½
Tersan 1991	1-2
Fungo	1-2
Spot Kleen	3/4-1½
Cleary 3336	3/4-1½

* Lower rates are to be used for preventive programs, higher rates for curative programs in 5-10 gals. water/1000 sq. ft.

SUMMARY

1.	Causal Agent:	Fungus
2.	Plant Parts Attacked:	Leaves
3.	Major Symptoms:	Mildew
4.	Time of First Noticable Symptoms:	Mid-Summer
5.	Spray Program:	Eradicative Fungicide Sprays
6.	Number of Applications per Season:	1-3

SAFE USE OF PESTICIDES

Stop!!! Read the label on every pesticide container each time before using the material. Pesticides must be applied only as directed on the label to be in compliance with the law. Avoid inhaling dusts or sprays. Open windows and ventilate the rooms while using pesticides. Never smoke or eat while spraying or dusting. Remove or cover food, feed, water, kitchen utensils and fish and other pets. Do not allow children near you when applying pesticides. Wash and clean up after using pesticides - change clothes if any pesticide was spilled. Dispose of empty containers safely. Bury 18" deep in an isolated area away from any water supply or place in a trash container. Do not burn aerosol cans. Store pesticides in their original containers in a locked cabinet or shed away from food. Be sure tops or caps are on tight. In case of an accident, follow label directions and call a physician immediately.

William E. MacHardy
Extension Plant Pathologist

3/76/5C-es

COOPERATIVE EXTENSION SERVICE

University of New Hampshire

Pest Fact Sheet

No. 44

PESTICIDE APPLICATOR TRAINING

TURF

RHIZOCTONIA BROWN PATCH

INTRODUCTION

Rhizoctonia brown patch is a common fungal disease of all commonly cultivated lawngrasses. It develops most readily at temperatures between 80-85°F. In addition to ideal temperatures and humid weather, heavy applications of nitrogen fertilizer favor disease development. Brown patch is characterized by roughly circular areas which may be a few inches to several feet in diameter.

DESCRIPTION

On close-cut grass, such as on golf and bowling greens, Rhizoctonia brown patch appears as light brown irregularly-shaped areas ranging from a few inches up to 2 feet in diameter. The coloration of these patches is at first a purplish green, but they rapidly fade to light brown as the leaves dry out.

Where high mowing is practiced, i.e., on home lawns, park lawns, and golf course fairways, the diseased areas range from 2 feet to 50 feet in diameter. These patches of light brown grass are more or less circular in outline and usually are closely appressed to the soil surface, creating a sunken or "pocket" effect.

The chief distinguishing feature of Rhizoctonia brown patch appears during periods of warm, humid weather, when dark, purplish "smoke rings," ½ to 2" wide, may border the diseased areas. The "halos" are more pronounced in the hours of early morning, usually fading by the middle of the day.

DISEASE CYCLE

The causal fungus survives from year to year in the form of resting bodies called sclerotia either within infected grass tissue or on the surface of the soil. The fungus is also capable of existing as a soil inhabitant for long periods in the absense of susceptible grass. Growth of the pathogen from the winter resting stage occurs when air temperatures reach 64°F.

Fungus penetration of the leaves may take place when the average daily air temperature reaches 73°F. Invasion of the leaf tissue occurs through leaf pores and wounds produced by mowing. Infection and disease development are slow at this temp-

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erature. However, when the air temperatures reach 80-85°F, particularly at 100% relative humidity, optimum conditions for infection are present and the fungus may completely blight a large area of turf within a period of 6 to 8 hours. When the air temperature reaches 90°F, parasitic activity of the fungus stops.

Although the disease may occur at low humidities, rainy weather and a saturated atmosphere (100% relative humidity) greatly speed disease development. Free moisture must be present on the leaves for the fungus to spread rapidly to healthy plants.

CONTROL

Fungicide applications can be made from July to September. Turfgrass species and varieties show different levels of susceptibility to Rhizoctonia brown patch. A preventive fungicide program is necessary to effectively control this disease on the highly susceptible species. Apply the first spray immediately after the first occurrence of night temperatures that do not drop below 70°F and continue at 5-10 day intervals if the daytime temperatures are 80°F or above and conditions of high humidity prevail. Avoid high nitrogen fertility.

FUNGICIDE	RATE IN OZ/1000 SQ.FT. *
Thiram	4-6
Tersan LSR	4-6
Daconil 2787	4-6
Dithane M-45	4-6
Acti-dione/Thiram	3-4
Tersan 1991	1-3
Cleary 3336	1-3
Fungo	1-3
Sport Kleen	3/4-2½

* Lower rates are to be used for preventive programs, higher rates for curative programs in 5-10 gals. water per 1000 sq. ft.

SUMMARY

1.	Causal Agent:	Fungus
2.	Plant Parts Attacked:	Leaf Tissue
3.	Major Symptoms:	Circular Brown Patches Bordered by Dark "Smoke Rings"
4.	Time of First Noticable Symptoms:	Mid-to-late summer following hot, humid weather conditions with prolonged minimum night temperatures above 65°F
5.	Spray Program:	Preventive Fungicide Sprays
6.	Number of Applications Per Season:	4-6

SAFE USE OF PESTICIDES

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COOPERATIVE EXTENSION SERVICE

University of New Hampshire

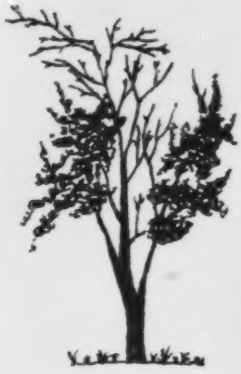
PESTICIDE APPLICATOR TRAINING

ORNAMENTALS

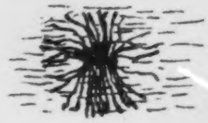
Pest Fact Sheet

No. 45

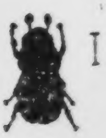
DUTCH ELM DISEASE



disease symptoms



tunneling



adult beetle

INTRODUCTION

Dutch elm disease is caused by a fungus that is carried from tree to tree by elm bark beetles. The disease was first described in Holland in 1921 (where the name originated) and was first found in eastern U.S. in the early 1930's. It is the most destructive shade tree disease in the United States today. All elm species are affected, but the American elm is most severely affected.

DESCRIPTIONS

Disease Symptoms: The first symptoms to appear are the wilting or "flagging" of the leaves. These will then dry out, turn yellow (then brown) and drop off the tree. Defoliated twigs will usually die immediately. Dead branches may appear on a portion of the tree. The tree may then die, branch by branch, over a period of several years. The process is more rapid on succulent, fast-growing trees trees than on slowly growing or senile ones. Sometimes an entire tree will develop disease symptoms and die within a few weeks. This does happen when trees are planted so close to one another that the fungus from an infected tree enters an adjacent healthy tree through root grafts.

A branch or twig which is infected will, in x-section, show discoloration and an accumulation of brown gummy materials in the outer growth ring. If the bark is peeled back from an infected tree, tunneling of the elm bark beetle can be seen (see diagram above). These galleries are where the adult female beetle deposits eggs. The symptoms of Dutch elm disease are sometimes confused with those of drought injury or feeding by the elm leaf beetle; however, in these cases, there is no discoloration in the sapwood and no tunneling.

Description of the Elm Bark Beetle: There are two species of bark beetles that carry the Dutch elm disease fungus, the European elm bark beetle (Scolytus multistriatus) and the native elm bark beetle (Hylurgopinus rufipes). They are stout, reddish-brown

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beetles, about 1/8" long. They feed on the twigs, often in the crotches, of healthy elm branches, especially in or very near trees that contain weak, injured, or sickly portions.

LIFE CYCLE

The beetles overwinter as larvae at the end of their tunnels, pupate in the outer bark and begin to appear in May. They can be found continuously from May to September. Egg-laying extends over a considerable time, and there is a second (and possibly third) summer generation each year. Elm bark beetles will only lay eggs in dead or dying elm tissue.

The fungus overwinters in the bark of an infected tree, so the beetles may pick up the fungus spores as they tunnel in an infected tree. The fungus spores are spread to healthy trees when the adult beetle emerges and flies to another tree to complete it's life cycle. In this way, both the disease cycle and the vector are closely connected. Throughout the summer months, the fungus grows and spreads causing the symptoms described above. A pile of dead elm logs favors the growth and spread of the disease, and the spread of the disease is especially favorable under humid conditions. The fungus can also be spread from tree to tree via natural root grafts.

CONTROL

Cultural Practices:
1. destroy dead elm material (logs, dead trees, etc.)
2. prune infected branches as soon as first symptoms are observed

Chemical Practices:
1. control of disease vector (elm bark beetles) by bark and twig applications of methoxychlor to break the host-vector-pathogen link -- this should be done early in the spring before the buds break
2. control of fungus by use of systemic fungicide such as benomyl or treat soil with vapam if there is danger of root grafting.

SUMMARY

1. Causal Agent:	Fungus
2. Disease Vector:	Elm Bark Beetles
3. Damaging Stage of Vector:	Adult
4. Overwintering Stage of Vector:	Larva
5. Number of Generations Per Year:	2-3
6. Time of Year When Damage Done:	May - September
7. Major Symptoms:	Flagging, Wilting, Browning of Current Year's Growth Ring

SAFE USE OF PESTICIDES

Stop!!! Read the label on every pesticide container each time before using the material. Pesticides must be applied only as directed on the label to be in compliance with the law.

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3/76/5C-es

COOPERATIVE EXTENSION SERVICE
University of New Hampshire

PESTICIDE APPLICATOR TRAINING

ORNAMENTALS

ES

Pest Fact Sheet

No. 46

THE MAPLE TRUMPET AND THE OAK LEAF SKELETONIZERS

The Maple Trumpet Skeletonizer: The maple trumpet skeletonizer, Epinotia aceriella, ranges in distribution from Canada to North Carolina. In New Hampshire, it is found primarily on red and sugar maple but also occurs on hawthorn and beech. Damage from the larvae is usually not serious.

Adults are white moths with dustings of gray and brown. Larvae are light green in color with a yellowish head and are approximately ½" in length when full grown.

The larvae can be found feeding singly in late summer. They spin long trumpet-like tubes of silk on the underside of the leaves and feed within this tube, eating all of the leaf except the veins and upper surface. These tubes are speckled with frass.

Damage from this insect pest is done so late in the season that the cost of control is often unnecessary. However, when control measures are needed, carbaryl, methoxychlor, or diazinon can be used in late July to early August.

The Oak Leaf Skeletonizer: Oaks, especially red and black oak, are the primary hosts of this skeletonizer, Bucculatrix ainsliella. The larval stage causes the damage, feeding upon the leaves and causing them to become brown on the underside with the tops of the feeding area speckled and white.

The adult moth has a black forewing with pale areas outlining an oval, blacker patch on the inner margin. The full-grown larva is a yellowish-green color, approximately 3/8" in length. Several of these larvae can be found hanging by fine threads in the vicinity of oak trees in late June. The white ribbed cocoon is one of the most conspicuous signs of the oak leaf skeletonizer.

This skeletonizer spends the winter as a pupa within a cocoon on fallen leaves, on grass, on tree trunks, and on sides of buildings. There are two generations per year. The first generation is usually unnoticed due to the low population levels. Adults emerge in late May and the second generation begins in late July. Larvae feed in late May and June and again in late August through October.

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Carbaryl, methoxychlor, or diazinon applied in early June for the first generation and again in early August will give adequate control.

SAFE USE OF PESTICIDES

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Jon P. Turmel

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3/76/5C-es

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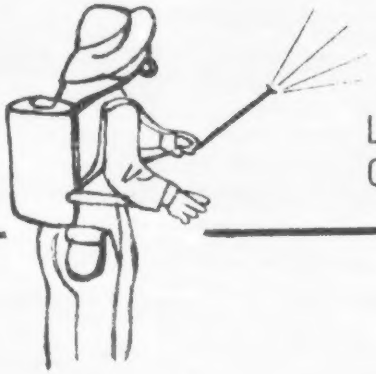
University of New Hampshire

PESTICIDE APPLICATOR TRAINING

ORNAMENTALS

Pest Fact Sheet

No. 47



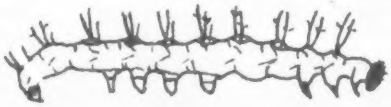
LEAF FEEDING CATERPILLARS

INTRODUCTION

The term "caterpillar" is generally used to describe the larvae of moths and butterflies. They come in a variety of sizes, shapes, and colors, with and without hairs or spines. They differ from sawfly larvae in that they have 5 or less pairs of prolegs on the abdomen which bear crochets (hooks) and the head capsule usually has 6 eyes on each side.

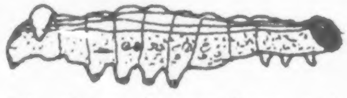
Caterpillars devour the foliage of trees and shrubs, either causing complete defoliation or leaving holes and irregular areas. There are several species that are important pests in New Hampshire.

Spiny Elm Caterpillar (Nymphalis antiopa)



The adult of this caterpillar is commonly known as the morning-cloak butterfly. Full grown caterpillars are black, with white and red dots scattered along the top of the abdomen. The head is covered with tubercles and the body has many large, branched spines. They commonly feed on elm, willow, poplar, and hackberry. The overwintering butterfly lays eggs in the spring and the larvae of the first generation are found in June and early July. A second generation occurs in late summer. The young larvae feed in groups until almost full grown.

Red-humped Oak Worm (Symmerista canicosta)



This species occurs throughout the northeast where it prefers oaks and other deciduous trees such as basswood, sugar maple, paper birch, beech, and elm. The adult is an ash gray moth while the full grown larva has a rounded, orange-red head and a yellowish body that has an orange-red enlargement (hump) on the 11th segment back from the head. The body is also marked with fine black lines on the top and has mottled areas on the sides.

Moths appear from May - July and lay eggs on the underside of leaves. The young larvae feed in groups and skeletonize the leaves. Older larvae feed alone and eat all except the larger veins. Pupation takes place in the ground. There is

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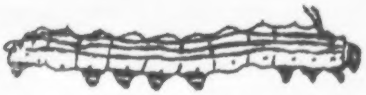
one generation per year.

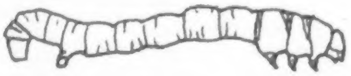
Green Striped Mapleworm (Anisota rubicunda)



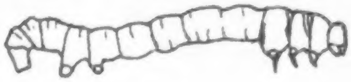
The preferred hosts of this worm are maples but it will also feed on oak and box elder. It occurs throughout most of the eastern U.S. and the population may become heavy enough to cause serious defoliation. The moth is yellow on top and pinkish beneath with a woolly body. The full grown larva has a cherry-red head, pale yellow-green body and are about 37 mm long. It has seven dark green to black lines running it's length, two slender horns on the thorax and two rows of short spines on each side of the body.

Eggs are laid on the leaves in May and June. The larva feed singly and devour the entire leaf. They become full grown in one month. There is one generation per year in New Hampshire.

Cankerworms (Spring and Fall)



spring



fall

The spring cankerworm (Paleacrita vernata) and the fall cankerworm (Alsophila pometerga) are common to the northeast and attack a variety of deciduous trees; but prefer elm and apple. The larvae of the two species occur at the same time of the year and cause the same type of damage. The primary difference between the two species is that the adult moths of the spring cankerworm emerge in April and May to lay eggs, while the fall cankerworm moths emerge in November and December to lay their overwintering eggs.

The larvae of the two species are known as inchworms, measuring worms, or loopers. They vary in color from green to brown but can be distinguished in that the fall cankerworm has 3 pair of abdominal legs while spring cankerworms have 2 pair. The female moth in both species is wingless.

The larvae feed on the foliage and buds early in the season and can completely defoliate a tree. Two or three years of defoliation can kill a tree.

CONTROL

Most leaf feeding caterpillars are easily controlled by spraying with carbaryl, methoxychlor, or malathion when the larvae first become active.

Applications for cankerworms should be made in May when the leaves are developing. Treatment should be made in June and July for the spiny elm caterpillar, red-humped oak worm and green striped maple worm.

SAFE USE OF PESTICIDES

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University of New Hampshire

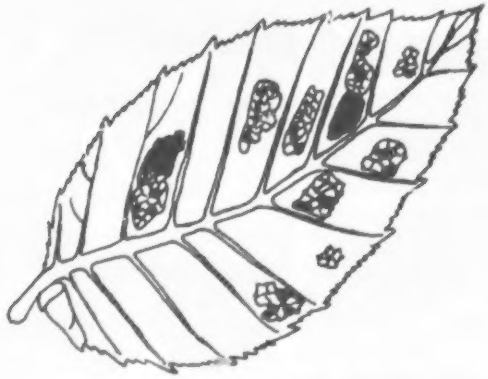
Pest Fact Sheet

No. 48

PESTICIDE APPLICATOR TRAINING

ORNAMENTALS

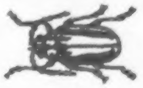
LEAF FEEDING BEETLES



INTRODUCTION

Along with certain caterpillars and sawfly larvae, there are certain species of beetles that are important pests on ornamental trees and shrubs because they destroy foliage. Most chew holes in the leaves giving them a skeletonizing effect and causing the leaves to turn brown and drop off the tree. In some cases, both the adults and the larvae cause the damage. Some of the important leaf feeding beetles in New Hampshire are described below.

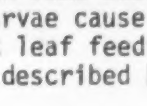
Elm Leaf Beetle (Pyrrhalta luteola Muller)



This pest can build up in large numbers and cause considerable destruction to all species of elms. The adult beetles, which are about 6 mm long and yellowish to dull green with a black stripe along the sides of the wing covers, spend the winter in protected areas, such as in attics and barns. They emerge in the spring and lay egg masses on the underside of elm leaves.

The larvae hatch in about 1 week and feed on the underside of the leaves for 2-3 weeks causing a typical skeletonizing damage. Young larvae are black when newly hatched but become dull yellow with black stripes down their back when full grown. When mature, they crawl down the trunks and pupate around the tree or in crevices in the trunk. Some of the emerging beetles will repeat the life cycle while most will seek hibernating quarters. Often, adult beetles hibernate in houses where they emerge into warm living quarters and become uninvited guests.

Elm leaf beetles do not transmit the Dutch elm disease fungus but the weakening of the trees through leaf loss will make them attractive to the bark beetle carriers of the disease.



Imported Willow Leaf Beetle (Plagiodera versicolora Laich)

This introduced species attacks several varieties of willow and poplar. The

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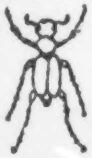
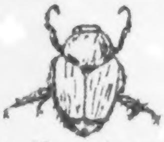
adult beetle is metallic blue or greenish in color, oval, and 3-4 mm long. It spends the winter under bark or in grass and debris near the base of the tree. They emerge in April or May and begin feeding on willow leaves causing a skeletonizing effect. Eggs are laid in irregular egg masses which hatch in about a week. The young larvae feed in groups or in rows on a leaf surface. The fully grown larvae are black, about 5 mm long, and have rows of protubercles the length and across the body. There are 3-4 generations per year.



Rose Chafer (*Macrodactylus subspinosus* Fab.)

The adult beetle of this species is tan to reddish brown, densely covered with dull yellow hairs, and have long, reddish-brown legs. They feed on a large number of trees and shrubs including grape, apple, peach, cherry, flowering crab, hawthorn, roses, and others. The winter is passed as a grub in the soil similar to white grubs or Japanese beetle grubs. The adults emerge in May or early June and feed on the buds and developing leaves of many host plants. Sometimes when the infestation is heavy they appear in swarms. They feed on the surface of the leaves and produce the skeletonization effect. Eggs are laid in the soil and the larvae feed on the roots of grasses but cause little damage.



Japanese Beetle (*Popillia japonica* Newman)

The Japanese beetle adult causes similar feeding damage on a variety of ornamental trees, shrubs, and food crops. For more information on its habit and life history, see Pest Fact sheets No. 23 and 39.

CONTROL

Applications of either carbaryl or methoxychlor when the adults or larvae are actively feeding on leaves are recommended for control of these pests. To prevent defoliation, treatments should be made as soon as the beetles appear. Repeat applications as needed in accordance with the label.

SAFE USE OF PESTICIDES

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